RECORD OF DECISION

DUBLIN TRICHLOROETHYLENE (TCE) SUPERFUND SITE

September 2002

PREPARED BY
THE U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION III

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Acronyms
Dublin TCE Superfund Site
Record of Decision

Act 2 Program	Pennsylvania Land Recycling and Environmental Remediation Standards Act
ARAR	Applicable or Relevant and Appropriate Requirements
Athlone	Athlone Industries
BAT	Best Available Technology
BCHD	Bucks County Health Department
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COC	Contaminants of Concern
COEC	Contaminants of Ecological Concern
CoPC	Contaminants of Potential Concern
CSM	Conceptual Site Model
CWA	Clean Water Act
DADI	Duration-averaged daily intakes
DADIC	Duration-averaged inhalation concentrations
DNAPL	Dense non-aqueous phase liquid
ELCR	Excess lifetime cancer risk
EPA	Environmental Protection Agency
EPC	Exposure Point Concentrations
ESD	Explanation of Significant Differences
°F	Degrees Farenheit
FFS	Focused Feasibility Study
gpm	Gallons per minute
HAP	Hazardous Air Pollutant
HEAST	Health Effects Assessment and Summary Tables
HI	Hazard Index
HQ	Hazard Quotient
IRIS	Integrated Risk Information System
KIC	Kollsman Instrument Corporation
KMC	Kollsman Motor Corporation
LADI	Lifetime-averaged daily intakes
LADIC	Lifetime-averaged inhalation concentrations
μg/l	micrograms per liter
mg/kg	Milligrams per kilograms
mg/l	Milligrams per liter
MCL	Maximum contaminant level
NAPL	Non-aqueous phase liquids

NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ND	Not detected
NOI	Notice of Intent
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
OU1	Operable Unit One
OU2	Operable Unit Two
PADEP	Pennsylvania Department of Environmental Protection
PAH	Polyaromatic hydrocarbons
PCB	Polychlorinated biphenyls
PCE	Perchloroethylene
POTW	Publically Owned Treatment Works
ppb	Parts per billion
ppmv	Part per million per volume
PRP	Potentially Responsible Party
RAGS	Risk Assessment Guidance
RAO	Remedial Action Objectives
RBC	Risk-Based Concentrations
RD	Remedial Design
RfCc	Reference Concentrations
RfDs	Reference Doses
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable maximum exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
Site	Dublin TCE Superfund Site
State Order	Consent Order and Agreement under the Commonwealth's Clean Streams Act
SVOC	Semi-volatile organic compounds
TBC	To be considered
TCE	Trichloroethylene
UCL	Upper Confidence Limit
VOC	Volatile Organic Compounds

RECORD OF DECISION
DUBLIN TCE SUPERFUND SITE

PART I: DECLARATION

A. SITE NAME AND LOCATION

Dublin Trichloroethylene (TCE) Superfund Site
Dublin Borough, Bucks County, Pennsylvania
EPA ID#PAD 981740004

B. STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedy for the Dublin TCE Superfund Site (Site), located in Dublin Borough, Bucks County, Pennsylvania. The remedy was developed and selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C.§§ 9601 et seq., and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. This decision is based on the Administrative Record for this Site. The Administrative Record for this Site is located at both the Environmental Protection Agency (EPA), Region III Office, located in Philadelphia, PA and the Dublin Borough Hall, located in Dublin Borough, PA.

The Commonwealth of Pennsylvania has concurred with the selected remedy.

C. ASSESSMENT OF THE SITE

The response action selected in this Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP §300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in groundwater may be viewed as source material. The Dublin TCE Superfund Site has been characterized as having NAPLs in the Source Area, which is located in the vicinity of the Fire Tower Well, because the concentration of the TCE is very high (>10,000 µg/l). To address these principal threat wastes, the selected remedy includes in-situ treatment to reduce the volume of the source material with a contingency for hydraulic containment of the source area.

D. DESCRIPTION OF THE SELECTED REMEDY

The selected remedy described below is the final response action for the Site. The remedy addresses contaminated groundwater at the Site and includes the following major components:

1. Incorporates all the components of Alternative 2.

    a. Continued operation of the Dublin Borough municipal water supply distribution system;

    b. Treatment of groundwater withdrawn by the Operable Unit One (OU1) supply well to meet Maximum Contaminant Levels (MCLs) using an air stripper as the primary treatment technology, and discharge of the treated groundwater to the Dublin Borough municipal water distribution system;

    c. Institutional controls to permanently limit the 120 Mill Street property to commercial/industrial land use with no residential use in the future and prohibit groundwater use.

    d. Design and implement a long-term monitoring plan for protection of human health and the environment and to evaluate remedy performance/plume migration.

2. Pre-Remedial Design Investigation to optimize all the components of the remedy. This will include pilot testing and design of the in-situ treatment system, the source containment pump and treat system, if required, as well as, further investigation of the dissolved plume for characterization.

3. In-situ treatment of the source area contamination.

4. A contingency to pump and treat 1-4 source area wells to achieve hydraulic containment of the contamination, if the in-situ treatment does not meet remediation goals.

5. Pump and treat downgradient wells, if it is determined to be required by the additional investigation of the dissolved plume.

6. Increased pumping of the OU1 supply well, if feasible.

7. Phased in approach for the remedial action.

E. STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate requirements to the remedial actions, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. The selected remedy also satisfies EPA's statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment).

A statutory Five-Year Review was completed for Dublin TCE on February 10, 2000. This review was triggered by the construction of the alternate water supply required by the ROD for Operable Unit One. The remedy selected in this ROD will not, upon completion, leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure; however, the remedy will require five years or more to complete. Therefore, EPA will continue to conduct Five-Year Reviews until they are no longer required. The next review will be conducted by February 10, 2005 to ensure that the remedy is, or will be, protective of human health and the environment.

F. ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary of this ROD. Additional information can be found in the Administrative Record file for this Site.

ROD CERTIFICATION CHECKLIST	
Information	**Location/Page number**
Chemicals of Concern and respective concentrations	Tables 1 & 2/13,14
Baseline risk represented by the chemical of concern	Tables 5 & 6/18-20
Cleanup levels established for chemicals of concern and the basis for these levels	Table 11/55
How source materials constituting principal threats are addressed	Section K/49
Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and the ROD	Section F/11

ROD CERTIFICATION CHECKLIST	
Potential land and groundwater use that will be available at the Site as a result of the Selected Remedy	Section L (4)/54
Estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected	Table 10/52-54
Key factors that led to selecting the remedy	Section L 91)/49

Abraham Ferdas, Director
Hazardous Site Cleanup Division
EPA, Region III

9/9/02
Date

RECORD OF DECISION
DUBLIN TCE SUPERFUND SITE

PART II - DECISION SUMMARY

A. SITE NAME, LOCATION, AND DESCRIPTION

The Dublin Trichloroethylene (TCE) Superfund Site (Site) is located in Dublin Borough, Bucks County, Pennsylvania. The National Superfund electronic database identification number is PAD 981740004. The U.S. Environmental Protection Agency (EPA) Region III is the lead agency for the Site, with the Pennsylvania Department of Environmental Protection (PADEP) as the support agency. The Site is currently being addressed through enforcement orders with the Potentially Responsible Parties (PRPs) performing the Remedial Investigation/Feasibility Study (RI/FS).

The contamination from the Dublin TCE Site originates from 120 Mill Street in Dublin Borough, Bucks County, Pennsylvania. The 120 Mill Street facility is an industrial facility surrounded by residences and businesses to the east, west, and south. To the north and west of the facility, a residential development has been constructed. The 120 Mill Street facility consists of a one-story brick building surrounded by a parking lot. A fire tower which was located at the northern boundary of the facility property has been taken down.

B. SITE HISTORY AND ENFORCEMENT ACTIVITIES

Contamination at the Site is a result of past manufacturing operations which utilized TCE as part of their normal operations. The Kollsman Motor Corporation (KMC) owned and operated the 120 Mill Street facility (from 1959 to 1971) for the manufacture of miniature precision motors, gear trains, clutches, brakes, and related electromechanical components which were used in manned aircraft and missiles. TCE was used as a degreasing solvent in this operation and was allegedly disposed of on the facility property.

In 1971, KMC sold the facility to Kollsman Instrument Corporation (KIC) which continued the operations of KMC. Sequa Corporation is the corporate successor of KIC. In 1973, KIC sold the facility to Athlone Industries, Incorporated (Athlone), who operated the facility from 1973 to 1986. Athlone used the facility to clean, stamp, package and store baseballs and softballs. Safety Solvent No.2, a solvent containing approximately 10% TCE, was used in 1982, by Athlone as a degreasing solvent for the assembly of three stamping machines. In 1986, Athlone sold the property to Mr. John H. Thompson who agreed to dispose of a partially full 30-gallon drum of TCE which was left on the facility property after Athlone sold the facility in 1986. Mr.

Thompson is the current owner and operator of the facility and uses a portion of the facility property to restore antique race cars.

During a routine drinking water survey in the summer of 1986, the Bucks County Health Department (BCHD) discovered levels of TCE up to 1000 parts per billion (ppb) in 23 tap water samples (EPA's Maximum Contaminant Level (MCL) allowed in drinking water is 5 ppb). Approximately 170 homes, apartments and businesses in Dublin Borough were affected. BCHD issued advisories to the public on the best approach to curtail water usage and prevent further exposure to TCE. For residences with TCE levels greater than 5 ppb, BCHD recommended the installation of carbon filters. For TCE levels above 500 ppb, BCHD cautioned residents not to use their tap water for bathing.

The EPA Region III Emergency Response Section received a request from BCHD to evaluate the Site on September 3, 1986. A preliminary assessment, conducted by EPA, determined the current water usage status of all the residential and commercial wells contaminated with TCE.

On June 29, 1987, EPA entered into a Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Section 106 Consent Order and Agreement (CERCLA 106 Order) with John H. Thompson. Mr. Thompson agreed to: 1) take action to assure that all residents and commercial employees exposed to TCE levels greater than 5 ppb would have an adequate treatment system in place or would be supplied with bottled water (as specified in the Work Plan attached to the CERCLA 106 Order); 2) conduct periodic monitoring of all carbon filters and air strippers being used by the residences and businesses to assure that the units were functioning properly; and 3) conduct periodic groundwater monitoring of wells for all residences and businesses at risk in accordance with the Work Plan.

Mr. Thompson, at the request of PADEP, installed two monitoring wells at the Site in 1988. Eight additional monitoring wells were installed off of the 120 Mill Street property under a separate study by Geraghty & Miller. Monitoring wells on the facility property and off the facility property detected contamination by Volatile Organic Compounds (VOCs), including TCE and vinyl chloride. Three municipal supply wells located in the Borough were tested for VOCs in 1991, by Dublin Borough. No contamination was detected in these wells.

On June 4, 1990, PADEP and Sequa Corporation entered into a Consent Order and Agreement under the Commonwealth's Clean Streams Act (State Order). Under the Order, Sequa Corporation agreed to investigate and abate the groundwater contamination problems at or near the facility. Sequa also agreed to submit a Recommended Remedial Action Plan to address the contaminated groundwater and provide for a water distribution system.

As a result of the field investigations, the Site was proposed to the National Priorities List (NPL) on October 26, 1989, and was formally added to the list on August 30, 1990.

The CERCLA 106 Order was amended in April 1991, and addressed the risk posed by inhalation of TCE vapors released from the groundwater by providing point-of-entry carbon filtration systems (i.e. treatment systems installed on the water source entering the household) to all residential dwellings with groundwater contamination greater than 5 ppb of TCE. At businesses, either bottled water or point-of-use carbon filtration systems (i.e. treatment systems located at the kitchen tap) were provided. Residences that were previously supplied with only point-of-use treatment systems were now supplied with the point-of-entry systems. Residential well testing conducted under the CERCLA 106 Order indicated that the groundwater was contaminated with several VOCs; TCE, perchloroethylene (PCE), and vinyl chloride.

In order to facilitate the effective remediation of the Site, EPA decided to divide the cleanup into two operable units. Operable Unit One (OU1) which focused on supplying safe drinking water to the residences and businesses and Operable Unit Two (OU2) which will remediate the contaminated groundwater. This Record of Decision (ROD) is for OU2.

In 1991, EPA conducted a Focused Feasibility Study (FFS) for OU1, to evaluate remedial alternatives for providing an alternate clean drinking water supply to the affected and potentially affected residences and businesses.

On December 30, 1991, EPA issued a ROD for OU1. The OU1 ROD was an interim action which included the construction of an alternate water supply. The alternate water supply was constructed in three phases. The first phase included a 1 ½ mile extension of the existing water line from the Dublin Borough to homes which were affected, or could potentially be affected, by contaminated groundwater from the Site. During this phase, service lines were also installed into designated homes; however, connections were not completed until January 1996.

The second phase was completed in three steps. First, the installation of a public water supply well and an associated treatment system were completed on February 9, 1998. Second, the completion of 62 service connections after the new supply well and treatment system were placed into continuous operation were completed on October 23, 1998. Lastly, abandonment of 70 private supply wells which were taken out of service in January 1999.

The third phase included a further extension of the water line into Hilltown Township, which is being documented in an Explanation of Significant Differences to the OU1 ROD. This phase provided public water to an additional 20 homes, which EPA determined were affected or could potentially be affected by contamination from the Site. This included the installation of an additional 1 ½ mile of water supply lines and a meter pit that allows the Dublin Borough to sell bulk water to the Hilltown Township Water and Sewer Authority. This phase was completed in April 1998.

The Remedial Action also requires the quarterly monitoring of residential and commercial wells that were not addressed by the public water supply but which have the potential for contamination. The monitoring will continue until EPA deems it no longer necessary.

EPA conducted potentially responsible party (PRP) searches in 1987 and 1990 and identified the following PRPs: Sequa Corporation (successor in ownership of KMC and KIC); Athlone Industries, Incorporated; and John. H. Thompson. Sequa Corporation and John H. Thompson were sent "special notice" letters on August 22, 1991. The letters indicated that EPA would not begin the remedial investigation or the feasibility study for the Site until 90 days from the date of the special notice letter provided that the PRPs agreed to implement the RI/FS. A general notice letter was sent to Athlone Industries, Incorporated on November 21, 1990 requesting participation on the on-going negotiations between Sequa Corporation, John H. Thompson and EPA for implementation of a RI/FS.

At least two federal lawsuits have been filed at the Site. These include Whistlewood Commons Associates v. Sun Chemical Corporation, Athlone Industries, Incorporated, and John H. Thompson, United States District Court for the Eastern District of Pennsylvania, Civil Action No. 87-6407, and Susan Coburn, etal. V. Sun Chemical Corporation, Athlone Industries, Incorporated, and John H. Thompson, United States District Court for the Eastern District of Pennsylvania, Civil Action No. 88-0120.

This ROD is being issued to implement the selected remedy for OU2, which is the final remedy for the Site.

C. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The public participation requirements of Sections 113 (k) (2) (B), and 117 (a), of CERCLA, 42 U.S.C. §§9613 (k) (2) (B), 9617 (a), as well as the general requirements of the National Oil and Hazardous Substances Contingency Plan (NCP), 40 C.F.R. § 300.430 (f) (3) have been met in the remedy selection process for implementation of the selected remedy outlined in this ROD.

The Administrative Record which includes documents EPA used to develop, evaluate, and select a remedy for the Site is available at the Dublin Borough Hall, located at 119 Maple Avenue in Dublin, PA and at the EPA Region III Office, located at 1650 Arch Street in Philadelphia, PA.

The Proposed Plan was released to the public on June 15, 2001. The notice of availability for the RI/FS and Proposed Plan was published in the *Montgomery County Record, Doylestown Intelligencer* and the *Courier Times* on June 15, 2001. A 30-day comment period began on June 15, 2001, and was initially scheduled to conclude on July 14, 2001. By request of Rouse Chamberlin Ltd., Sequa Corporation, and Dublin Borough, the public comment period was extended until August 30, 2001. The notice to extend the comment period was published in the *Montgomery County Record. Doylestown Intelligencer* and the *Courier Times* on July 12, 2001.

A second request by Dublin Borough, extended the comment period to September 28, 2001. The second notice to extend the comment period was published in the *Montgomery County Record, Doylestown Intelligencer* and the *Courier Times* on August 30, 2001.

A public meeting to discuss the Proposed Plan was held during the public comment period on June 27, 2001. At the meeting representatives from EPA answered questions about the Site and the remedial alternatives under consideration. Approximately 20 people attended the meeting, including residents from the impacted area, PRPs, township officials, and news media representatives. A summary of comments received during the comment period and EPA's responses are contained in Part III of this document.

D. SCOPE AND ROLE OF RESPONSE ACTIONS

Remediation of the contaminated groundwater from the site was organized into two operable units:

OU1: Supply safe drinking water to residences and businesses

OU2: Contamination of the groundwater

EPA has already selected the remedy for OU1 in a ROD dated December 30, 1991. The OU1 remedy consisted of the following major components:

- Expansion of the Dublin Borough municipal water supply distribution system;
- Continuous pumping of the OU1 supply well at 40 gallons per minute (gpm);
- Treatment of groundwater withdrawn by the OU1 supply well to meet MCLs using an air stripper as the primary treatment technology, and discharge of the treated groundwater to the Dublin Borough municipal water distribution system;
- Implementation of institutional controls on the development and use of wells within the plume of contamination; and
- Monitoring a specified list of existing groundwater supply wells in the vicinity of Dublin Borough that are located beyond the plume boundary to ensure protection.

The remedial action for OU1 was completed in January 1999. An Explanation of Significant Differences (ESD)was signed on July 15, 2002, to document the extension of the waterline into Hilltown Township.

The second operable unit, the subject of this ROD, addresses the TCE contamination of the groundwater. The potential risk associated with exposure to the groundwater is considered unacceptable by EPA standards. The concentration of TCE in the groundwater exceeds the maximum contaminant level for drinking water, as specified in the Safe Drinking Water Act. It is important to note that this pathway of exposure is incomplete under current conditions due to the remedial action undertaken in OU1. This second operable unit presents the final response action for this site and addresses a principal threat at the site through the removal and treatment of Non-Aquous Phase Liquid (NAPL) source material in the aquifer.

E. SUMMARY OF SITE CHARACTERISTICS

1. Physical

The Site is located in Dublin Borough, PA and includes the facility at 120 Mill Street as well as the contaminated aquifer emanating from the facility (Figure 1).

The aquifer is classified as Class IIA, a current source of drinking water. An estimated 10,100 people obtain drinking water from public and private wells within 3 miles of the Site. Based on available information, the groundwater flows from southeast to northwest beneath the Site and is controlled predominately by fractures. Groundwater beneath the Site flows towards residential and commercial wells in Dublin Borough. Although the exact size of the Site cannot be determined due to the contaminated aquifer, the Site can be further characterized by (1) physical setting; (2) geology; (3) hydrology, and (4) and nature and extent of contamination.

Dublin Borough (Borough) is located within the Triassic Lowlands section of the Piedmont Physiographic Province. The borough is in an upland area within a region of flat to rolling hills. The elevations above sea level in the borough range from about 500 feet at the northwestern boundary to about 620 feet at the southeastern boundary for a relief of approximately 120 feet. The nearest surface-water body to the 120 Mill Street property is a small, intermittent, unnamed tributary that originates near the northern corner of the borough boundary. The tributary flows to the north into Bedminster Township where it enters Deep Run. Deep Run flows to the northeast where it enters Tohickon Creek. No other surface streams are present within the Borough.

2. Geology

The area in the vicinity of the Site is underlain by Triassic-age non-marine sedimentary rocks of the Newark Group. In southeastern Pennsylvania, the Newark Group is subdivided in ascending order into the Stockton, Lockatong, and Brunswick Formations. These formations occur in the Newark Basin, an elongated northeast-trending structural basin extending from southeastern New York to northern Virginia. The Newark Basin is one of a series of disconnected extensional basins that are situated along the Atlantic coast from Nova Scotia to North Carolina.

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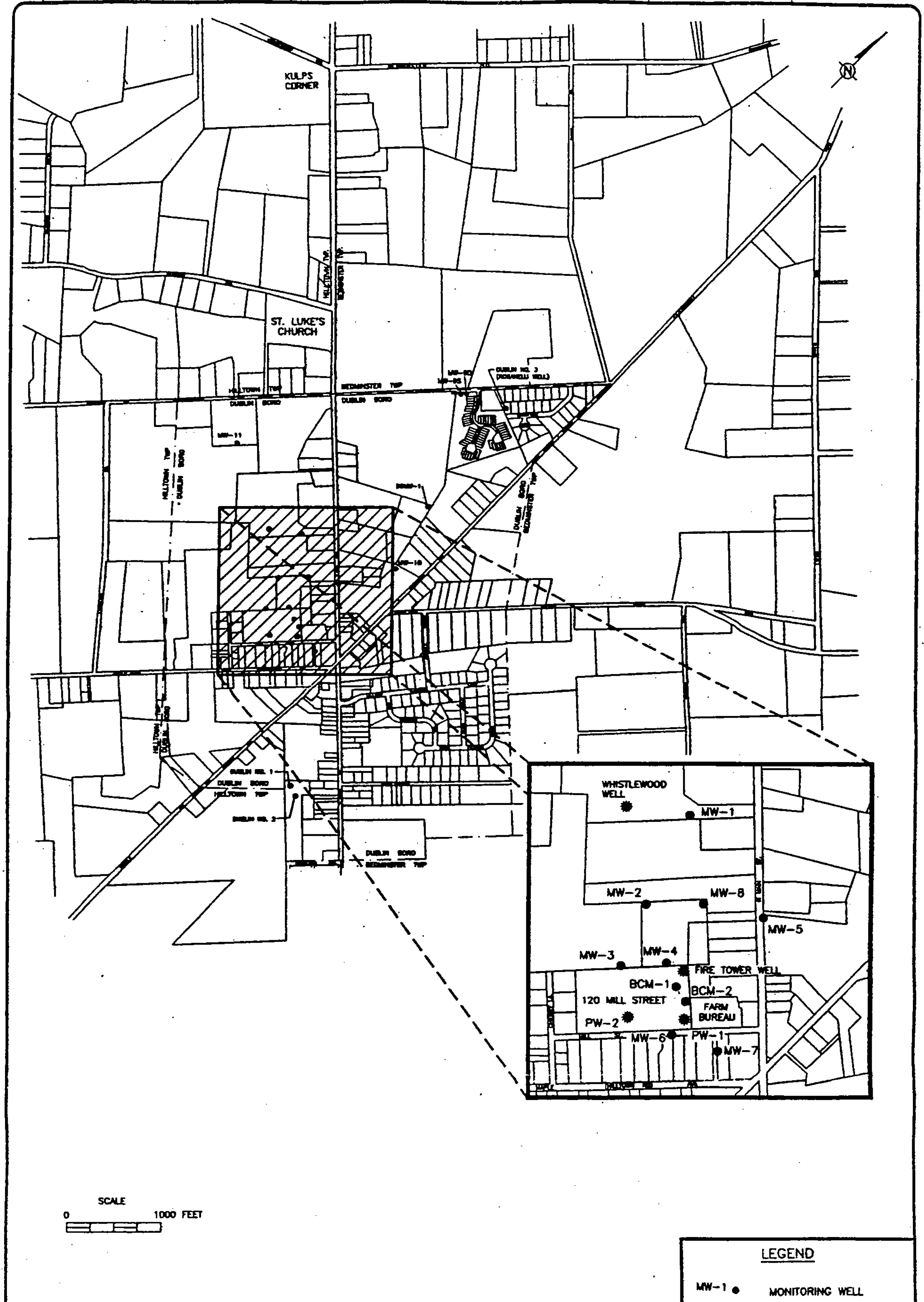

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MUNICIPAL AND PROPERTY BOUNDARIES

DUBLIN NPL SITE, DUBLIN, PENNSYLVANIA
SEQUA CORPORATION

FIGURE 1

The sequence of rocks underlying the Dublin area is part of a mixed zone of varying units of the Lockatong Formation. The interlayering is thought to be primary in origin, resulting from oscillations between lacustrine and fluvial conditions in a depositional basin environment. The Lockatong Formation consists mainly of thick-bedded gray and black siltstone and shale. The sediment of these units is believed to have been deposited in a lacustrine or swampy environment, under reducing conditions. Interbedded among the gray and black siltstones and shales are thinner reddish-brown sandy siltstone units. The sandy siltstone units are thought to have been deposited in an alluvial, more oxidizing environment.

The top bedrock at the Site is encountered between 5 and 12 feet below land surface. Based on drilling logs, the bedrock is comprised of interbedded gray and red beds of the Lockatong Formation dipping to the northwest.

3. Hydrology

The Lockatong unit generally provides adequate supplies of groundwater to wells for domestic uses. Groundwater flow in the study area is believed to be dominated by joint systems and dipping bed planes. In the more competent gray and black siltstone and shale units, permeability is maximum downward through the vertical joint systems, and storage is minor. In the reddish-brown sandy siltstone units, permeability is greatest parallel to the sedimentary layering, and storage is greater. Generally, the permeability of the gray and black siltstones and shale units is an order of magnitude less than that of the reddish-brown sandy siltstone units.

In the area of the Site, groundwater generally is encountered between 14 and 53 feet below land surface and flows in a northwesterly direction.

4. Nature and Extent of Contamination

TCE at the Site was released through spills to the soil and groundwater. Through secondary release mechanisms the contamination was identified as potentially being in the air, surface soils, subsurface soils and groundwater. The potential receptors are current and future on-site workers, excavation workers, residents, trespassers and biota terrestrial. (Refer to section 5. Conceptual Site Model)

The investigation into the nature and extent of the contamination associated with the Site was started in 1986, and includes the remedial investigation (RI) conducted by Geraghty & Miller from 1991 - 1996. Results of the RI and previous sampling activities at the Site indicate that soil and groundwater beneath the 120 Mill Street facility have been impacted by VOCs from historic activities. VOCs, semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs) and metals were detected at very low levels in on-site soil samples. The presence and concentrations of these constituents in on-site soils varied with location and depth; therefore, a discrete source area for these constituents could not be identified. The 120 Mill

Street facility, where the soil samples were located, is approximately 4.5 acres, most of which is covered by pavement. Sediments in a ditch receiving storm water runoff from the facility were also sampled as part of the RI. VOCs, SVOCs, pesticides, PCBs and metals were also detected in the ditch sediment samples, but were determined to be of no consequence in the base line risk assessment.

Analytical data for groundwater samples collected from locations throughout the Dublin Borough from 1986, to present identified a plume of chlorinated VOCs in the fractured bedrock aquifer beneath the facility and portions of the Borough. The primary constituent of concern in the groundwater is TCE. The data indicate that the plume migrates from the facility and extends laterally to the north/northwest from the Site, which coincides with the direction of groundwater flow. Figure 3 is an interpretation of where the plume may be located beneath the Site.

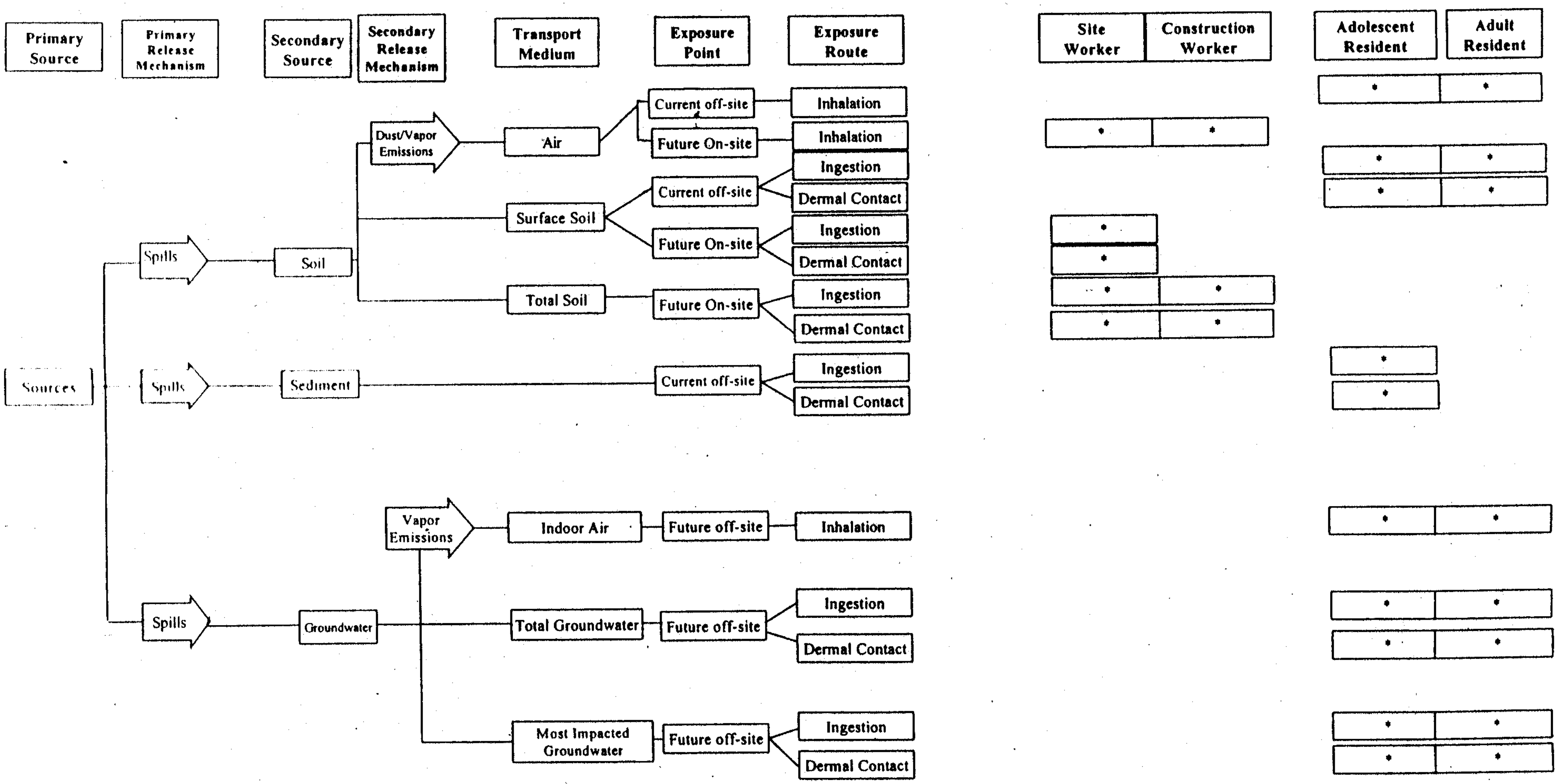
The maximum TCE concentrations within the plume were identified in samples collected from discrete depth intervals via packer testing of the Fire Tower Well located on the facility. The TCE concentrations for the six depth interval samples collected from the Fire Tower Well during a packer sampling ranged from 7,400 micrograms per liter (µg/l) to 55,000 µg/l. The maximum TCE concentration on the Fire Tower Well was detected at a depth of 458-478 feet below the surface. A groundwater sample representative of the entire interval of the Fire Tower Well had a TCE concentration of 6,200 µg/l. TCE concentrations detected in other wells on the facility property between 1986 and 1996, ranged from 300-17,500 µg/l. The concentrations of TCE detected in the Fire Tower Well and at other locations on the facility are indicative of dense non-aqueous phase liquid (DNAPL).

5. Conceptual Site Model (CSM)

The sources of contamination, release mechanisms, exposure pathways to receptors for the groundwater, as well as other site-specific factors, are diagramed in a CSM, Figure 2. The CSM is a three-dimensional "picture" of Site conditions that illustrates contaminant sources, release mechanisms, exposure pathways, migration routes, and potential human and ecological receptors. It documents current and potential future Site conditions and shows what is known about human and environmental exposure through contaminant release and migration to potential receptors. The risk assessment and response action for the Site are based on this CSM, as described below.

The CSM for the Site identifies the primary release mechanism as spills onto the soil, sediment, and groundwater. Dust and vapor emissions were a secondary release mechanism into the air and indoor air. Site receptors included Site workers, construction workers, adolescent residents and adult residents. The exposure routes included inhalation, ingestion and dermal contact.

Figure 2 - Conceptual Site Model



F. CURRENT AND POTENTIAL FUTURE LAND AND WATER USES

The Site is located in an industrialized area of Dublin Borough. The 120 Mill Street facility consists of a one-story brick building surrounded by a parking lot, which currently is used to restore antique race cars. The facility is surrounded by residences and businesses to the east, west, and south. A new residential development has been constructed to the north and west of the site. The land use in Dublin Borough and the surrounding communities is primarily residential and agricultural. This ROD proposes that the facility property be subject to a perpetual deed restriction which would limit the use to commercial/industrial uses. The deed restriction would be executed by the property owner. The EPA has also sent a request to Dublin Borough to limit the 120 Mill Street property to industrial use only in next revision to the Borough's Comprehensive Plan.

The VOC contaminated groundwater plume extends from the industrialized area to residential and agricultural areas in a north/northwesterly direction. An estimated 10,100 people obtain their drinking water from this aquifer using public and private wells within 3 miles of the Site. The aquifer is classified as Class IIA, a current source of drinking water. Groundwater use restrictions have been implemented by Dublin Borough Ordinances #164 (as amended by #219) and #200. It is anticipated that the aquifer will continue to be classified as Class IIA into the future.

This ROD proposes remedial actions which should result in unlimited use of the aquifer in the future. Currently, a portion of the water used for drinking water purposes needs to be treated prior to use, due to the contamination in the aquifer.

G. SUMMARY OF SITE RISKS

Based on the results of the RI, a risk assessment was conducted to estimate the human health and environmental hazards that could result if no remedial action was taken at the Site. The purpose of the risk assessment is to establish the degree of risk or hazard posed by contaminants at the Site, and to describe the routes by which humans or environmental receptors could come into contact with these contaminants. This section of the ROD will: (1) provide a brief summary of the human health risk assessment; (2) provide a brief summary of the ecological risk assessment; and, (3) state the basis for the response action at the Site.

1. Human Health Risks Summary

A baseline risk assessment was performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the Site assuming no remedial action was taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the baseline risk assessment for this Site.

a) Identification of Chemicals of Concern

Chemicals of Potential Concern (CoPCs) for each medium and exposure pathway were selected based on a variety of criteria. CoPCs are selected based on both their carcinogenic and non-carcinogenic toxicity. The maximum concentration of each detected chemical was compared to medium-specific Risk-Based Concentrations (RBCs) to identify COPCs. The RBCs were developed by EPA using standard risk assessment algorithms that incorporated conservative exposure assumptions and toxicity data.

For screening purposes, RBCs were adjusted to correspond to a hazard quotient of 0.1 for systemic toxicants (i.e., non-carcinogens). A lifetime excess cancer risk of 1.0×10^{-6} was used to establish RBCs for carcinogenic constituents. This type of screening approach incorporates the use of risk-based screening levels to eliminate insignificant chemicals from further consideration. Chemical concentrations exceeding RBCs were retained for further evaluation using standard risk assessment methodology. Chemicals detected in less than five percent of the samples collected for that medium were not retained as Chemical of Concern (COCs).

Chemical concentrations were also compared to site-specific background concentrations for unaffected samples from each medium. Although some chemicals had concentrations below the medium-specific background concentrations, these were retained for further evaluation in the risk assessment if the constituent concentration exceeded the RBC. From this, a subset of the chemicals were identified as presenting a significant current of future risk and are referred to as the COCs in this ROD and summarized in Tables 1and 2.

Table 1
Summary of Chemicals of Concern and Medium Specific Exposure Point Concentrations

Scenario Timeframe: Future
Medium: Total Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
Ingestion	trichloroethene	0.000089	15	mg/l	139/297	0.32	mg/l	95% UCL
	total manganese	0.0019	13.6	mg/l	4/8	6.6	mg/l	95% UCL
Inhalation	trichloroethene	0.000089	15	mg/l	139/297	0.32	mg/l	95% UCL

Key:

mg/l: milligram per liter
95% UCL: 95% upper confidence limit

The table represents the Chemicals of Concern (COCs) and exposure point concentration for each of the COCs detected in groundwater (i.e. the concentration that will be used to estimate the exposure and risk from each COC in the groundwater). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e. the number of times the chemical was detected in the samples collected at the Site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that trichloroethene was the most frequently detected COC in the groundwater at the Site.

Table 2
Summary of Chemicals of Concern and Medium Specific Exposure Point Concentrations

Scenario Timeframe: Future
Medium: Most Impacted Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
Ingestion	trichloroethene	1.5	15	mg/l	15/15	8.5	mg/l	95% UCL
	total manganese	0.0177	14.0	mg/l	6/7	7.5	mg/l	95% UCL
Inhalation	trichloroethene	1.5	15	mg/l	15/15	8.5	mg/l	95% UCL
	chloroform	0.0007	0.026	mg/l	7/15	0.023	mg/l	95% UCL

Key:

mg/l: milligram per liter
95% UCL: 95% upper confidence limit

The table represents the Chemicals of Concern (COCs) and exposure point concentration for each of the COCs detected in the most impacted groundwater (i.e. the concentration that will be used to estimate the exposure and risk from each COC in the groundwater). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e. the number of times the chemical was detected in the samples collected at the Site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that trichloroethene was the most frequently detected COC in the groundwater at the Site.

Potential human health effects associated with exposure to the chemicals of potential concern were estimated quantitatively and qualitatively through the development of several hypothetical exposure pathways. These pathways were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the Site. The Site is located in an industrialized area of Dublin Borough. The 120 Mill Street facility consists of a one-story brick building surrounded by a parking lot, which currently is used to restore antique race cars. The facility is surrounded by residences and businesses to the east, west, and south. A new residential development has been constructed to the north and west of the site. The land use in Dublin Borough and the surrounding communities is primarily residential and agricultural.

b) Exposure Assessment

An exposure assessment was conducted as part of the health risk assessment portion of the baseline risk assessment. The purpose of the exposure assessment is to estimate the way a population potentially may be exposed to constituents originating at the Site. Typically this involves projecting concentrations along hypothetical pathways between sources and receptors. The projection usually is accomplished using site-specific data and, when necessary, mathematical modeling. Exposure can occur only when the potential exists for a receptor to directly contact released constituents or there is a mechanism for released constituents to be transported to a receptor. Without exposure, there is no risk; therefore, the exposure assessment is a critical component of the risk assessment.

The CSM identified both child and adult residents as the potential receptors of the contaminated groundwater discussed in this ROD. Since groundwater is the source of drinking water, a potential for exposure exists.

Potable water for local residents within the vicinity of 120 Mill Street property whose supply wells were impacted by contamination is now provided by the municipal water supply system as a result of the implementation of the ROD for OU1. Nevertheless, the estimated risks associated with residential exposure to groundwater have been calculated. For assessment purposes, two groundwater scenarios were evaluated. Potential exposures for local residents who may contact groundwater for potable uses were evaluated using data collected from all monitoring and supply wells (i.e., total groundwater). In addition, risks were estimated for hypothetical exposures to the "most impacted wells". Data for this evaluation were taken from wells BCM-1, Fire Tower, and PW-1.

c) Toxicity Assessment

The toxicity assessment weighs available evidence regarding the potential for a particular contaminant to cause adverse effects in exposed individuals. Where possible, the assessment provides a quantitative estimate of the relationship between the extent of exposure to a contaminant and the increased likelihood or severity of adverse effects. The toxicity assessment includes hazardous identification and information to determine if exposure to a contaminant can cause an increase in the incidence of an adverse health effect (carcinogenic and non-carcinogenic) and a dose-response evaluation to quantify the relationship between the exposure of the contaminant at the levels present to increased incidence of adverse effects.

The toxicity assessment in the baseline risk assessment evaluated both the carcinogenic and the non-carcinogenic toxicity effects. Toxicity values used in the risk assessment were obtained from the Integrated Risk Information Systems (IRIS) (1996) and Health Effects Assessment and Summary Tables (HEAST) (USEPA, 1995).

Current risk assessment guidance requires that the averaging time used to calculate average daily exposure doses on the toxic effect (cancer or non-cancer). For cancer effects, the total cumulative dose was averaged over a lifetime (70 years) whereas the total cumulative dose was averaged over the exposure period for non-cancer effects. The approach for carcinogens is based on the assumption that any dose may induce a response (non-threshold), and a given dose has the same probability of inducing a response regardless of the exposure period. In other words, a higher dose received over a short exposure period is equivalent to a lower dose received over a lifetime, as long as the total dose is the same. For oral and dermal exposures, lifetime-averaged daily intakes (LADIs) are calculated for assessing cancer effects, and duration-averaged daily intakes (DADIs) are calculated for assessing non-cancer effects. For inhalation exposure, lifetime-averaged inhalation concentrations (LADICs) and duration-averaged inhalation concentrations (DADICs) are calculated for cancer and non-cancer effects, respectively.

Excess lifetime cancer risks were determined for each exposure pathway by multiplying a daily intake level with the chemical specific cancer potency factor. Cancer potency factors have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk is unlikely to be greater than the risk predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g., 1×10^{-6} or 1/1,000,000 or 1E-6) and indicate (using this example), that an average individual is not likely to have greater than a one in a million chance of developing cancer over 70 years as a result of site-related exposure (as defined) to the compound at the stated concentration. All risks estimated represent an "excess lifetime cancer risk" - or the additional cancer risk on top of that which we all face from other causes such as cigarette smoke or exposure to ultraviolet radiation from the sun. The chance of an individual developing cancer from all other (non-site related) causes has been estimated to be high as one in three. EPA's generally acceptable risk range for site-related exposure is 10^{-4} to 10^{-6}. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

A summary of the cancer toxicity data relevant to the chemicals of concern is presented in Table 3 below.

Table 3
Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Chemical of Concern	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Slope Factor Units	Weight of Evidence/Cancer Guideline Description	Source
Trichloroethene	1.10E-02	1.10E-02	kg-day/mg	C-B2	IRIS
Chloroform	6.00E-03	6.00E-03	kg-day/mg	B2	IRIS

Table 3
Cancer Toxicity Data Summary

Pathway: Inhalation

Chemical of Concern	Unit Risk	Units	Inhalation Cancer Slope Factor	Weight of Evidence/Cancer Guideline Description	Source
Trichloroethene	1.70E-06	m^3/ug	----	C-B2	IRIS
Chloroform	2.30E-05	m^3/ug	----	B2	IRIS

Key:
---- : No information available
IRIS: Integrated Risk Information System, U.S. EPA

EPA Group:
B2 - Probable human carcinogen - Indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible Human Carcinogen

This table provides carcinogenic risk information which is relevant to the contaminants of concern in groundwater. At this time, slope factors are not available for the dermal route of exposure. Thus, the dermal slope factors used in the assessment have been extrapolated from oral values. An adjustment factor is sometimes applied, and is dependent upon how well the chemical is absorbed via the oral route. Adjustments are particularly important for chemicals with less than 50% absorption via the ingestion route.

In assessing the potential for adverse effects other than cancer, a hazard quotient (HQ) is calculated by dividing the daily intake level by the reference dose (RfD) or other suitable benchmark. Reference doses have been developed by EPA and they represent a level to which an individual may be exposed that is not expected to result in any deleterious effect. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. A HQ ≤ 1 indicates that a recepor's dose of a single contaminant is less than the RfD, and that toxic noncarcinogenic effects from that chemical are unlikely. The Hazard Index (HI) is generated by adding the HQs for all media to which the same individual may reasonably be exposed. A HI ≤ 1 indicates that toxic noncarcinogenic effects are unlikely. A summary of the noncarcinogenic toxicity data relevant to the chemicals of concern is presented in Table 4 below.

Table 4 Non-Cancer Toxicity Data Summary								
Pathway : Ingestion, Dermal								
Chemical of Concern	Oral RfD Sub-chronic Value (mg/kg/day)	Oral RfD Chronic Value (mg/kg/day)	Dermal RfD Sub-Chronic Value (mg/kg/day)	Dermal RfD Chronic Value (mg/kg/day)	Primary Target Organ	Confidence Level/ Uncertainty Factors	Source of RfD:Target Organ	Dates
trichloroethene	6.00E-03	6.00E-03	6.00E-03	6.00E-03	Liver	low/3000	NCEA	NA
manganese	1.40E-01	2.30E-02	5.60E-03	9.20E-04	CNS	medium/1	IRIS	5/96

Key:

NCEA : National Center for Environmental Assessment
IRIS: Integrated Risk Information System, U.S. EPA
NA: Not applicable

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in groundwater. Oral RfDs (generally based on an administered dose) are adjusted for GI absorption efficiency to represent a toxicity factor which is based on an absorbed dose (called the dermal RfD here). Adsorption efficiency factors are presented in Table 4-5 of the Baseline Risk Assessment.

Table 5 depicts the carcinogenic risk summary for the chemicals of concern in groundwater evaluated to reflect present and potential ingestion ans inhalation of the groundwater by future residents corresponding to the reasonable maximum exposure (RME) scenario. Table 6 depicts the non-carcinogenic risk summary for the chemicals of concern in groundwater evaluated to reflect present and potential ingestion of groundwater by future residents corresponding to the RME scenario. Only those exposure pathways deemed relevant to the remedy being proposed are presented in this ROD. Readers are referred to the Baseline Risk Assessment for a more comprehensive risk summary of all exposure pathways evaluated for all chemicals of potential concern and for estimates of the central tendency risk.

Table 5
Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk		
				Inhalation	Ingestion	Exposure Route Total
groundwater	groundwater	Off-Site Showering	trichloroethene	1.1E-04	N/A	1.1E-04
groundwater	groundwater (most impacted)	Off-site ingestion	trichloroethene	N/A	5.12E-04	5.12E-04
groundwater	groundwater (most impacted)	Off-Site Showering	trichloroethene	2.8E-03	N/A	2.8E-03
			chloroform	1.0E-04	N/A	1.0E-04

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk		
				Inhalation	Ingestion	Exposure Route Total
groundwater	groundwater (most impacted)	Off-site ingestion	trichloroethene	N/A	8.78E-04	8.78E-04
groundwater	groundwater (most impacted)	Off-Site Showering	trichloroethene	2.4E-03	N/A	2.4E-03
			chloroform	8.7E-05	N/A	8.7E-05
					Groundwater Risk Total	2.8E-03

Key:
N/A: Route of exposure is not applicable

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a child and adult's exposure to groundwater, as well as the toxicity of the COCs. The total risk level is estimated to be 2.8E-03. This risk level indicates that if no cleanup action is taken, an individual would have an increased probability of 3 in 1000 of developing cancer as a result of site-related exposure to the COCs.

Table 6
Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target organ	Non-Carcinogenic Hazard Quotient
groundwater	groundwater (total)	Off-site ingestion	trichloroethene	liver	1.5
			manganese	CNS	7.9
			Total Hazard Index		9.4
groundwater	groundwater (most impacted)	Off-site ingestion	trichloroethene	liver	3.9E+01
			manganese	CNS	8.9
			Total Hazard Index		40.9

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target organ	Non-Carcinogenic Hazard Quotient
groundwater	groundwater (total)	Off-site ingestion	trichloroethene	liver	3.4
			manganese	CNS	18
			Total Hazard Index		21
groundwater	groundwater (most impacted)	Off-site ingestion	trichloroethene	liver	9.1E+01
			manganese	CNS	2.1E+01
			Total Hazard Index		1.12E+02

Key:

CNS: Central Nervous System

This table provides the Hazard Quotients (HQs) for each route of exposure and the Hazard Index (HI) for all routes of exposure. The Risk Assessment Guidance (RAGS)for Superfund states that, generally, an HI greater than 1 indicates the potential for adverse non-cancer effects. The estimated HIs indicate that the potential for adverse non-cancer effects could occur from exposure to contaminated groundwater.

The only pathways which exceeded EPA's acceptable cancer risk range and/or hazard quotient of concern are ingestion of groundwater and inhalation of groundwater during showering by both adult and child off-site residents. No unacceptable risks were identified for the other media.

Lifetime cancer risk estimates for the most impact groundwater is 2.8E-03, mostly due to TCE. EPA's HI of concern is exceeded for both children and adults for several target organs. The major contributor is TCE.

d) Uncertainty Analysis

There are uncertainties associated with each aspect of risk assessment, from environmental data collection through risk characterization. Some uncertainties bias risk estimates low while others bias risk high. EPA's general approach is to choose conservative but reasonable values for exposure variables so that true risks are unlikely to be higher than risks estimated by the baseline risk assessment. The baseline risk assessment for the Site was limited by unavailable toxicity values and limited carcinogenicity data.

Toxicity values were not available from EPA for all of the CoPCs in media at the Site. The lack of RfDs and CSFs for a number of the constituents may result in an underestimate of risk associated with exposure to these constituents.

Limited carcinogenicity data was available for developing CSFs for the carcinogenic PAHs. Benzo(a)pyrene is one of the most potent carcinogenic PAHs. The CSFs for benzo(a)pyrene and the toxicity equivalency factors were used for estimating the carcinogenic potency of the carcinogenic PAHs. The carcinogenic risks associated with potential dermal exposure to carcinogenic PAHs were not evaluated. EPA guidance states that it is not appropriate to use the oral slope factor to evaluate risks associated with dermal exposure to carcinogens that cause skin cancer through a direct action at the point of application. The lack of appropriate dermal CSFs for carcinogenic PAHs results in uncertainty in the cancer risk estimates for the exposure to the PAHs. The resulting cancer risk estimates for exposure to PAHs may be low.

Recent research on the mechanisms of carcinogenesis suggests that use of the linearized multistage model may overestimate the cancer risks associated with exposure to low doses of chemicals. At high doses many chemicals cause large-scale cell death which stimulates replacement by division. Dividing cells are more subject to mutations than quiscent (non-dividing) cells; thus, there is an increased potential for tumor formation. It is possible that administration of these same chemicals at lower doses would not increase cell division and thus would not increase mutations. This would suggest that the current methodology may over-estimate cancer risk.

There is a great deal of uncertainty in the TCE CSF and in the calculated ELCRs for potential exposures to TCE in media at the Site. The EPA has withdrawn the carcinogenicity assessment of TCE in which this chemical has been classified as a probable human carcinogen (i.e., group B2). The carcinogenicity assessment has been withdrawn in response to growing weight of evidence that indicates that the mechanism of the induction of liver tumors observed in mice may not be relevant to the assessment in humans. This suggests that the risks calculated for exposure to TCE may be over-estimated.

e) Conclusions

Contaminants present at the Site result in increased carcinogenic and non-carcinogen risks to human health under certain scenarios. The highest risk is for the off-site child receptor for both soil and groundwater. As a result of the implementation of the ROD for OU1, potable water is provided by the Dublin Borough municipal supply system to all residents within the plume of groundwater contamination. Since the future risk still exists due to the groundwater still being contaminated, the estimated risks associated with residential exposure to groundwater were calculated and determined to be above the acceptable HI of 1 for both adult and child receptors. The estimated lifetime cancer risk estimates are above the EPA's target risk range for both the adult and child receptor.

2. Ecological Risk Assessment

The purpose of the Ecological Risk Assessment is to determine if Site contaminants have the potential to adversely affect to ecological receptors. An ecological investigation was conducted at the Site in August 1992. The objectives of the investigation were to: 1) gather qualitative information on the ecological communities present at and adjacent to the Site, and 2) document any readily apparent evidence of stress on ecological communities at the Site. The investigation and subsequent ecological risk assessment identified constituents of ecological concern, evaluated the relationship between ecological receptors and media, assessed ecological effects and characterized ecological risk.

a) Identification of Constituents of Ecological Concern

Surface soil constituents of ecological concern (COECs) were initially selected based on a comparison of constituent concentrations with background constituent concentrations. Constituents not exceeding background concentrations were eliminated as COECs. Screening benchmarks were derived based on the lowest (most conservative) concentration reported to be toxic to vegetation. Maximum surface soil concentrations detected at the Site were used for comparison to soil benchmark values because plants are immobile. The maximum soil concentration conservatively represents the potential exposure of the most exposed individual and, therefore, is a conservative estimate of the exposure encountered by the population. Constituents for which maximum detected concentrations did not exceed phytotoxic concentrations were eliminated as COECs. Table 7 presents the occurrence, distribution and selection of Chemicals of Concern.

Table 7
Selection of COECs Based on
Comparison to Background and Phytotoxicity Concentrations
(Surface Soils)

Chemical of Potential Concern	Frequency (detects/total)	Range of Detects		UCL	Background UCL	Phytotoxic Value	Retained or Reason for Elimination
		Minimum	Maximum				
VOCs							
Acetone	1/9		0.21	0.073	ND	NA	Retained
Chlorobenzene	1/9		0.001	0.0010	ND	NA	Retained
Chloroform	1/9		0.001	0.0010	ND	NA	Retained
Chloromethane	1/9		0.02	0.011	ND	NA	Retained
1,2-Dichloroethene (mixed)	3/9	0.003	0.28	0.094	ND	NA	Retained
Ethylbenzene	3/9	0.003	0.51	0.17	ND	9 [a]	Does not exceed phytotox
2-Hexanone	1/9		0.03	0.018	ND	NA	Retained
Tetrachloroethene	2/9	0.003	0.083	0.030	ND	40 [a]	Does not exceed phytotox
Toluene	4/9	0.002	0.37	0.12	ND	200 [a]	Does not exceed phytotox
Trichlorothene	6/9	0.001	0.12	0.043	ND	78 [a]	Retained [b]
Vinyl chloride	1/9		0.007	0.0066	ND	NA	Retained
Xylenes (total)	3/9	0.013	4.6	1.5	ND	500 [a]	Does not exceed phytotox
SVOCs							
Acenaphthene	2/8	0.053	0.8	0.63	ND	0.926 [c]	Does not exceed phytotox
Acenaphthylene	1/8		0.063	0.063	ND	0.926 [c]	Does not exceed phytotox
Anthracene	2/8	0.071	1.8	1.3	Nd	17.8 [c]	Does not exceed phytotox

Table 7
Selection of COECs Based on
Comparison to Background and Phytotoxicity Concentrations
(Surface Soils)

Chemical of Potential Concern	Frequency (detects/total)	Range of Detects		UCL	Background UCL	Phytotoxic Value	Retained or Reason for Elimination
		Minimum	Maximum				
Benzo(a)anthracene	3/8	0.09	2.6	1.9	0.097	NA	Retained
Benzo(a)pyrene	3/8	0.072	1.6	1.2	0.11	>17,500	Does not exceed phytotox
Benzo(b)fluoranthene	4/8	0.077	2.2	1.6	0.15	NA	Retained
Benzo(g,h,i)perylene	2/8	0.078	0.6	0.48	0.051	NA	Retained
9H-Carbazole	2/8	0.044	0.74	0.58	ND	NA	Retained
Chrysene	4/8	0.055	1.9	1.4	0.15	NA	Retained
Di-n-butyl phthalate	1/8		0.04	0.040	ND	NA	Retained
Dibenzo(a,h)anthracene	1/8		0.11	0.11	ND	NA	Retained
Fluoranthene	4/8	0.12	5.5	4.0	0.22	NA	Retained
Fluorene	2/8	0.038	0.86	0.67	ND	NA	Retained
Indeno(1,2,3-cd)pyrene	3/8	0.043	0.7	0.55	0.072	NA	Retained
2-Methylnaphthalene	1/8		0.67	0.54	ND	NA	Retained
Naphthaalene	2/8	0.038	0.23	0.23	ND	10 [c]	Does not exceed phytotox
Phenanthrene	4/8	0.068	6.9	4.5	0.12	NA	Retained
Pyrene	4/8	0.089	4.7	3.4	0.25	NA	Retained
Pesticides/PCBs							
Aroclor 1242	2/3	0.013	0.12	0.15	ND	40 [c]	Does not exceed phytotox

Table 7
Selection of COECs Based on
Comparison to Background and Phytotoxicity Concentrations
(Surface Soils)

Chemical of Potential Concern	Frequency (detects/total)	Range of Detects		UCL	Background UCL	Phytotoxic Value	Retained or Reason for Elimination
		Minimum	Maximum				
alpha-BHC	1/3		0.002	0.0023	ND	NA	Retained
alpha - Chlordane	1/3		0.0002	0.00016	ND	NA	Retained
gamma - Chlordane	1/3		0.0037	0.0045	ND	NA	Retained
Dieldrin	1/3		0.0088	0.011	0.00026	NA	Retained
Endosulfan I	1/3		0.0071	0.0090	0.0025	NA	Retained
Endrin	1/3		0.0089	0.011	ND	NA	Retained
Endrin ketone	1/3		0.0013	0.0013	ND	NA	Retained
Heptachlor epoxide	1/3		0.0011	0.0011	ND	NA	Retained
Inorganics							
Aluminum	3/3	9,490	15,300	17,000	20,000	50 [a]	Does not exceed background
Antimony	1/3		4	4.8	ND	5 [c]	Does not exceed phytotox
Arsenic	3/3	3.9	9.3	11	6.6	10 [a]	Does not exceed phytotox
Barium	3/3	55.8	110	140	210	500 [a]	Does not exceed background
Beryllium	3/3	0.51	1.2	1.4	1.7	10 [c]	Does not exceed background
Cadmium	1/3		1.2	1.5	ND	3 [a]	Does not exceed phytotox
Calcium	3/3	2,020	2,980	3,500	4,800	NA	Does not exceed background

Table 7
Selection of COECs Based on
Comparison to Background and Phytotoxicity Concentrations
(Surface Soils)

Chemical of Potential Concern	Frequency (detects/total)	Range of Detects		UCL	Background UCL	Phytotoxic Value	Retained or Reason for Elimination
		Minimum	Maximum				
Chromium	3/3	21.1	46.4	56	40	1 [a]	Not site related
Cobalt	3/3	11.5	17.6	20	27	NA	Does not exceed background
Copper	3/3	15.6	77.3	96	37	90 [a]	Does not exceed phytotox
Iron	3/3	23,800	33,400	36,000	40,000	NA	Does not exceed background
Lead	3/3	11.9	53.2	69	180	50 [a]	Does not exceed background
Magnesium	3/3	2,140	5,510	6,500	4,400	NA	Essential nutrient
Manganese	3/3	441	686	830	1,300	500 [a]	Does not exceed background
Mercury	2/3	0.17	0.22	0.31	0.095	0.3 [c]	Does not exceed phytotox
Nickel	3/3	10.9	101	130	29	30 [a]	Not site related
Potassium	3/3	510	991	1,100	1,600	NA	Does not exceed background
Vanadium	3/3	36.6	63.1	71	71	2 [c]	Does not exceed background
Zinc	3/3	30.8	116	150	330	50 [a]	Does not exceed background

Key:

a Will and Suter, 1994
b Constituent concentration does not exceed comparison criteria, but was retained as a COEC because it is the principal constituent of concern at the Site.
c Phytotox database, 1993
NA Not available
ND Not detected
UCL 95 % upper confidence limit (one-tailed) on the mean, assuming a normal distribution

The ERA focused on representative receptors that may be affected directly or indirectly by selected COECs and the likelihood and extent of those effects. Because surface water is present only infrequently at the Site (during storm events), it is not considered a medium of concern. Exposure to groundwater at the Site by ecological receptors is not expected to occur; therefore, groundwater is not considered a medium of concern. Consequently, assessment endpoints focus primarily on terrestrial receptors.

b) Exposure Assessment

The exposure assessment evaluates the relationship between ecological receptors and media at the Site. Potential exposure pathways, exposure point concentrations, specific target receptor species, and exposure doses were evaluated.

The primary means by which ecological receptors may be exposed to constituents at the Site is through incidental ingestion of and dermal contact with surface soil. Potential exposure pathways for terrestrial wildlife include ingestion of food (either plant or animal), incidential ingestion of soil while foraging, grooming or burrowing, and inhalation of particulates or vapors potentially released at the Site. The total exposure by terrestrial wildlife is represented by the sum of the exposures from each individual source.

Terrestrial vegetation may be directly exposed to constituents in soil through uptake by the roots. This may occur in a passive mode as the plant takes up water from the root zone or by active uptake mechanisms. VOCs and solubilized particulate matter may potentially enter plants through leaf stomata or plant cuticle.

The principal COCs at the Site are TCE and other solvents in the groundwater. Past releases of TCE may have resulted in relatively low concentrations of TCE in soil. There are currently no groundwater discharge points at, or associated with, the Site which would allow ecological receptors to be exposed to constituents in groundwater. Therefore, groundwater exposure is not a viable pathway for ecological receptors.

It is not feasible to determine COEC effects on all species using habitats at the Site; therefore, target receptor species were selected and evaluated as surrogate species for terrestrial organisms with the greatest potential for exposure. The Eastern cottontail rabbit (*Sylvilagus floridanus*) was selected as a terrestrial herbivorous mammilian target species, and the American robin (*Turdus migratorius*) was selected as an avian omnivorous target species.

c) Ecological Effects Assessment

Toxicity information derived from the literature was used to develop benchmark values for the selected indicator species. By comparing constituent concentrations measured at the Site to these benchmarks, the likelihood that constituents pose a risk to ecological receptors was determined.

Calculated exposure doses and constituent concentrations were compared to benchmarks to derive HQs used in the assessment. To determine potential hazards to the indicator species, benchmarks related to reproductive endpoints were used whenever possible. Reproductive endpoints generally are considered protective at the population level, against sublethal adverse effects associated with chronic exposure to a particular constituent. However, based on a comprehensive review of the scientific literature, measurement endpoints related to reproductive effects were not available for some COECs.

d) Ecological Risk Characterization

Potential risks to herbivorous terrestrial wildlife were assessed by comparing estimated daily doses of COECs (based on the 95% Upper Confidence Limit (UCL)) with toxicological benchmark values using the eastern cottontail rabbit as an endpoint species. The rabbit was assumed to be exposed to COECs through the ingestion of COECs in vegetation and the incidental ingestion of COECs in soil. The cumulative HI is 0.86. No COEC concentration produced HQs greater than1 for the rabbit. Therefore, COEC concentration detected in soil media at the Site are unlikely to present a risk to herbivorous terrestrial species.

Potential risks to avian omnivore were assessed similar to the herbivorous terrestrial wildlife using the American robin as an endpoint species. The robin was assumed to be exposed to COECs through ingestion of COECs in earthworms, vegetation, and the incidental ingestion of soil and sediment. The cumulative.HI is 0.1. This indicates that there is minimal potential for risk as a result of exposure to these COECs through the ingestion of surface soil and vegetation and earthworms that may take up soil COECs.

3. Basis of Action

While ecological risk assessment revealed that there is no substantial risk to ecological receptors due to site-related COCs, the baseline human health risk assessment revealed that future residents potentially exposed to COCs in groundwater via ingestion and inhalation of groundwater may present an unacceptable human health risk. As such, actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

H. REMEDIAL ACTION OBJECTIVES

A future risk still exists due to the groundwater, which is a current source of drinking water, still being contaminated. As a result of the implementation of the ROD for OU1, potable water is provided by the Dublin Borough municipal supply system to all residents within the plume of groundwater contamination. This portion of the groundwater which is used for drinking water is treated for contamination prior to distribution. The Remedial Action Objectives (RAOs) for the Site focus on remediating the contaminated aquifer.

The (RAOs) for the site are:

- Restore the aquifer to drinking water standards;
- Remediate and/or contain the source area contamination; and
- Prevent or minimize further migration of the contaminant plume

I. DESCRIPTION OF ALTERNATIVES

The FS evaluated alternative remedial approaches and technologies for containing further migration of a source area plume located in the vicinity of 120 Mill Street, reducing the volume of contamination in the source area, and remediation of the dissolved VOC plume. The FS discusses the full range of alternatives evaluated for the Site and provides supporting information relating to the alternatives in the Proposed Plan. The Proposed Plan discussed a No Further Action alternative, as required by the NCP at 40 CFR § 300.430 (e)(6), and other alternatives that were determined by EPA to be protective of human health and the environment, achieve state and federal regulatory requirements, and best achieve the cleanup goals for the Site. EPA's Selected Remedy is Alternative 8A, which is a modified and combined version of Alternatives 6 and 8.

The Superfund Program is required to evaluate the "No Action" Alternative to determine the need for remediation at a site and to serve as a baseline for all other alternatives to be compared. However, for sites where an interim response action has been implemented to address imminent risks to human health and the environment, a "no further action" alternative, which acknowledges the interim remedial action, becomes the baseline. In the event that the other identified alternatives do not offer substantial benefits in the reduction of toxicity, mobility, or volume of the contaminants of concern, the No Further Action alternative may be considered a feasible approach.

1. Common Elements

The remedial alternatives, except for the no further action alternative, contain some common elements. All the elements of Alternative 2, limited action, are included in alternatives 3 through 8A.

Long-term groundwater monitoring of the contamination plume is included in all the alternatives. Monitoring would be performed to ensure protection of human health and to evaluate remedy performance/plume migration.

Institutional controls to restrict use of groundwater exceeding remediation goals are included in all remedial action alternatives, because the alternatives may require a long period of time to achieve the RAOs. Institutional controls would be implemented, which would permanently limit the 120 Mill Street property to commercial/industrial land use with no residential use in the future. Groundwater use for the 120 Mill Street facility property would also be restricted and would supplement the restrictions on groundwater use that are imposed by Dublin Borough Ordinances #164 (as amended by #219) and #200 which require connection to the public water supply system where available, and that groundwater be of potable quality for all private supply wells, respectively.

A discount rate of 7% and a period of 30 years for operation and maintenance (O&M)were used for cost estimating. Although some remedial alternatives will require costs for longer time periods, for comparing costs a maximum period of 30 years was used to provide a consistent basis for cost estimating. The cost estimates for each alternative are based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the administrative record file, an explanation of significant differences, or ROD amendment. The ROD estimates is an order-of-magnitude engineering cost estimate that is expected to be within -30 to +50 percent of the actual project cost.

Alternatives 3 through 8A all contain an element which requires pumping the contaminated groundwater. The pumped groundwater will be treated to remove the contamination prior to discharge. The method of treatment has not been determined, but air stripping is a common method chosen to remove VOCs in groundwater. Air emission controls may be required. Discharge of the treated groundwater will be determined based on quantity of treated water, proximity of discharge points and availability of discharge points.

2. Alternatives

The description of each alternative will be presented in three sections: 1) description of remedy components; 2) distinguishing features; 3) and, expected outcomes. The costs presented for each alternative will include capital costs, annual operation and maintenance costs and the 30-year present worth cost calculated using a discount rate of 7%.

Alternative 1: No Further Action

Description of Remedy Components:

- No work will occur at the Site. (The remedy outlined in the ROD for OU1 has been implemented.)

Distinguishing Features of the Alternative:

- The alternative may be reliable for the long-term if institutional controls are enforced and the long-term monitoring plan in place as part of the ROD for OU1 is adequate.
- The alternative will not fully comply with groundwater ARARs (attainment of MCLs) since no groundwater remediation is to occur.
- No construction will occur, therefore, implementation can happen quickly.
- This alternative is similar to alternative 2, but is less protective of human health and the environment.
- The cost of this alternative is as follows:

Capital Cost:	$0
Annual O&M Costs:	$0
30-year Present Worth:	$0

Expected Outcome of the Alternative:

- Remediation goals will not be reached as no treatment is to occur.
- Institutional controls must stay in effect and long-term monitoring must continue indefinitely.
- The groundwater will not be restored to beneficial use.

Alternative 2: Limited Action

Description of Remedy Components:

- Institutional controls would be implemented, which would permanently limit the 120 Mill Street property to commercial/industrial land use with no residential use in the future. Groundwater use for the 120 Mill Street facility property would also be restricted and would supplement the restrictions on groundwater use that are imposed by Dublin Borough Ordinances #164 (as amended by #219) and #200.
- Design and implement a long-term monitoring plan, which is more comprehensive than the plan implemented as part of the ROD for OU1, for protection of human health and to evaluate remedy performance/plume migration.

Distinguishing Features of the Alternative:

- This alternative may be reliable for the long-term if institutional controls are enforced and the long-term monitoring plan is adequate.
- The alternative will not fully comply with groundwater ARARs (attainment of MCLs) since no groundwater remediation is to occur.
- No construction will occur, therefore, implementation can happen quickly.

- This alternative is similar to alternative 1, but provides greater protection of human health and the environment.
- This alternative is an element of alternatives 3 through 8A.
- The cost of this alternative is as follows:

Capital Cost:	$ 0
Annual O&M Costs (Years 1-5):	$ 43,900
Annual O&M Costs (Years 6-30):	$ 22,000
30-year Present Worth:	$362,800

Expected Outcome of the Alternative:

- Remediation goals will not be reached as no treatment is to occur.
- Institutional controls must stay in effect and long-term monitoring must continue indefinitely.
- The groundwater will not be restored to beneficial use.

Alternative 3: Increased Pumping of OU1 Supply Well

Description of Remedy Components:

- Incorporate all the components of Alternative 2.
- Increase pumping of the OU1 supply well from 40 gpm to 64 gpm.

Distinguishing Features of the Alternative:

- Increasing the pumping rate from the OU1 supply well would enhance the lateral extent of hydraulic control created by the supply well to ensure additional capture of the downgradient portion of the TCE plume.
- This alternative may prevent the overall migration of the contaminated plume, but it does not control the areas of high contamination.
- This alternative may never comply with groundwater ARARs (attainment of MCLs) since groundwater remediation would be minimal.
- The amount of groundwater being pumped is comparable to the Dublin Borough demand for potable water. Drought conditions, which are the conditions at the time this ROD is being written, may preclude pumping at this increased rate.
- Implementation can occur in a timely manner, since most of the components are in place.
- The cost of this alternative is as follows:

Capital Cost:	$ 21,600
Annual O&M Costs (Years 1-5):	$ 50,400
Annual O&M Costs (Years 6-30):	$ 28,500
30-Year Present Worth:	$465,100

Expected Outcome of the Alternative:

- Remediation goals may never be attained because treatment is minimal.
- Institutional controls must stay in effect and long-term monitoring must continue indefinitely.

Alternative 4: Pumping OU1 Supply Well at 40 gpm and a Source Area Well at 5 gpm

Description of Remedy Components:

- Incorporate all the components of Alternative 2.
- Pump and treat a source area well (in the vicinity of 120 Mill Street) at 5 gpm.
  - pretreatment may be required prior to treatment.
  - air emission controls may be required.
- Discharge treated water to Dublin Borough's Publically Owned Treatment Works (POTW).

Distinguishing Features of the Alternative:

- Limited containment of the source area contamination.
- Limited removal of contaminant mass in the source area.
- No treatment for the dissolved phase of the groundwater plume.
- Treated water not returned to drinking water system.
- The implementability of this alternative was determined to be good.
- The cost of this alternative is as follows:

Capital Cost:	$ 87,900
Annual O&M Costs (Years 1-5):	$ 106,700
Annual O&M Costs (Years 6-30):	$ 84,800
30-Year Present Worth:	$1,230,000

Expected Outcome of the Alternative:

- Remediation goals will take in excess of 30 years to attain.
- Institutional controls must stay in effect and long-term monitoring must continue indefinitely.

Alternative 4C: Pumping OU1 Supply Well at 40 gpm and Source Area Well at 20 gpm

Description of Remedy Components:

- Incorporate all the components of Alternative 2.
- Pump and treat source area well(s) (in the vicinity of 120 Mill Street) at a total of 20 gpm.

- pretreatment may be required prior to treatment.
- air emission controls may be required.
- Discharge treated water to Dublin Borough Municipal storm sewer system or other appropriate means of disposal.

Distinguishing Features of the Alternative:

- Hydraulic containment of the source area contamination.
- Removal of contaminant mass in the source area.
- No treatment for the dissolved phase of the groundwater plume.
- Treated water not returned to drinking water system.
- The implementability of this alternative was determined to be good.
- The cost of this alternative is as follows:

Capital Cost:	$ 105,200
Annual O&M Cost (Years 1-5):	$ 88,700
Annual O&M (Years 6 - 30):	$ 66,800
30-Year Present Worth:	$1,023,900

Expected Outcome of the Alternative:

- Remediation goals will take in excess of 30 years to (or may never) be met.
- Institutional controls must stay in effect and long-term monitoring must continue indefinitely.

Alternative 5: Pumping OU1 Supply Well and a Downgradient Well

Description of Remedy Components:

- Incorporate all the components of Alternative 2.
- Pump and treat a downgradient well using the treatment system in place for the OU1 supply well.
  - groundwater would be conveyed by pipeline to the existing OU1 treatment system.
  - treated groundwater would be discharged to the Borough's water supply distribution system.
- OU1 supply well would remain pumping at 40 gpm.

Distinguishing Features of the Alternative:

- Treatment for the dissolved phase of the groundwater plume.
- Treated water returned to drinking water system.
- Increased potential of the contaminated groundwater moving beyond the area currently supplied potable water.

- No treatment or containment of the source area contamination.
- The implementability of this alternative was determined to be acceptable. Use/acquisition of private property would be required for downgradient well.
- The cost of this alternative is as follows:

Capital Cost:	$ 71,100
Annual O&M Cost (Years 1-5):	$ 52,300
Annual O&M Cost (Years 6-30):	$ 30,400
30-Year Present Worth:	$538,100

Expected Outcome of the Alternative:

- Remediation goals will take in excess of 30 years to attain.
- Institutional controls must stay in effect and long-term monitoring must continue indefinitely.

Alternative 6: Pumping OU1 Supply Well and Source Area In-Situ Treatment

Description of Remedy Components:

- Incorporate all the components of Alternative 2.
- In-situ treatment of source area contamination either using chemical oxidation, enhanced bioremediation or both.

Distinguishing Features of the Alternative:

- Estimated removal of 75% of the source area contamination.
- No treatment for the dissolved phase of the groundwater plume..
- The implementability of this alternative was determined to be acceptable if the oxidant can be effectively be applied to the contamination.
- The cost of this alternative is as follows:

Capital Cost:	$264,800
Annual O&M Cost (Years 1-5):	$ 43,900
Annual O&M Cost (Years 6-30):	$ 22,000
30-Year Present Worth:	$627,600

Expected Outcome of the Alternative:

- Remediation goals may never be met if only 75% of the contaminant volume is removed.
- Institutional controls must stay in effect and long-term monitoring must continue indefinitely.

Alternative 7: Pumping a Source Area Well at 20 gpm, the OU1 Supply Well at 20 gpm, and three Downgradient Wells at 5 gpm

Description of Remedy Components:

- Incorporate all the components of Alternative 2.
- Pump and treat source area well(s) (in the vicinity of 120 Mill Street) at a total of 20 gpm.
  - pretreatment may be required prior to treatment.
  - air emission controls may be required.
- Pump and treat three downgradient wells at 5 gpm each.
  - pretreatment may be required prior to treatment.
  - air emission controls may be required.
- Discharge treated water to Dublin Borough Municipal storm sewer system or other appropriate means of disposal.
- Reduce pumping of the OU1 supply well to 20 gpm

Distinguishing Features of the Alternative:

- Hydraulic containment of the source area contamination.
- Treatment for the dissolved phase of the groundwater plume.
- Treated water discharged to storm sewer system or returned to drinking water system.
- Increased potential of the contaminated groundwater moving beyond the area currently supplied potable water.
- The implementability of this alternative was determined to be acceptable. Use/acquisition of private property would be required for downgradient wells.
- The cost of this alternative is as follows:

Capital Cost:	$636,500
Annual O&M Cost (Years 1-5):	$ 99,100
Annual O&M Cost (Years 6-30):	$ 77,200
30-Year Present Worth:	≥$1,684,300

Expected Outcome of the Alternative:

- Remediation goals will take in excess of 30 years to attain.
- Institutional controls must stay in effect and long-term monitoring must continue indefinitely.

Alternative 8: Pumping a Source Area Well at 20 gpm, the OU1 Supply Well at 20 gpm, and twelve Downgradient Wells at 5 gpm

Description of Remedy Components:

- Incorporate all the components of Alternative 2.
- Pump and treat source area well(s) (in the vicinity of 120 Mill Street) at a total of 20 gpm.
  - pretreatment may be required prior to treatment.
  - air emission controls may be required.
- Pump and treat twelve downgradient wells at 5 gpm each.
  - pretreatment may be required prior to treatment.
  - air emission controls may be required.
- Discharge treated water to Dublin Borough Municipal storm sewer system, returned to the Dublin Borough Drinking Water System, or other appropriate means of disposal.
- Reduce pumping of the OU1 supply well to 20 gpm

Distinguishing Features of the Alternative:

- Hydraulic containment of the source area contamination.
- Treatment for the dissolved phase of the groundwater plume.
- Treated water discharged to storm sewer system and/or returned to drinking water system.
- The implementability of this alternative was determined to be acceptable. Use/acquisition of private property would be required for downgradient wells.
- The cost of this alternative is as follows:

Capital Cost:	$2,807,200
Annual O&M (Years 1-5):	$ 118,800
Annual O&M (Years 6-30):	$ 96,900
30-Year Present Worth:	≥$4,099,400

Expected Outcome of the Alternative:

- Remediation goals will take in excess of 30 years to attain, although modeling predicts this alternative reaches the remediation goals in the shortest amount of time.
- Institutional controls must stay in effect and long-term monitoring must continue indefinitely.

Alternative 8A: Source Area In-Situ Treatment, Contingency for Pumping 1-4 Source Area Wells at a total of approximately 20 gpm (hydraulic containment), Downgradient Wells pumping at approximately 5 gpm (if required), and increased pumping of the OU1 supply well

Description of Remedy Components:

- Incorporate all the components of Alternative 2.
- Pre-Remedial Design Investigation to optimize all the components of the remedy. This will include pilot testing and design of the in-situ treatment system, the source containment pump and treat system, if required, as well as, further investigation of the dissolved plume.
- In-situ treatment of the source area contamination. If, within three years from the date of this ROD, remediation goals have not been met nor successfully demonstrated that they will be met, the contingency pump and treat will be implemented.
- A contingency to pump and treat 1-4 source area well(s) (in the vicinity of 120 Mill Street) at a total of 20 gpm, if remediation goals are not met by the in-situ treatment.
  - pretreatment may be required prior to air stripping.
  - air emission controls may be required.
- Pump and treat downgradient wells at 5 gpm each (necessity and/or number of wells determined during design).
  - pretreatment may be required prior to air stripping.
  - air emission controls may be required.
- Discharge treated water to Dublin Borough Municipal storm sewer system, returned to the Dublin Borough Drinking Water System, or other appropriate means of disposal.
- Increased pumping of the OU1 supply well, if feasible.
- Phased in approach to remedial action.

Distinguishing Features of the Alternative:

- Estimated removal of 75% of the source area contamination.
- Hydraulic containment of the source area contamination, if remediation goals are not met by in-situ treatment.
- Treatment for the dissolved phase of the groundwater plume.
- Retardation of the plume during implementation of the other components of the remedial action.
- Treated water discharged to storm sewer system and/or returned to drinking water system.
- The implementability of the in-situ portion of this alternative was determined to be acceptable if the oxidant can effectively be applied to the contamination.
- The implementability of the pump and treat portion of this alternative was determined to be acceptable. Use/acquisition of private property would be required for downgradient wells.

- Phased in approach would optimize remedial action implementability and effectiveness.

- The cost of this alternative is as follows (cost assumes contingency portion will be implemented):

Capital Cost:	$1,660,600
Annual O&M (Years 1-5):	$ 128,055
Annual O&M (Years 6-30):	$ 106,155
30-Year Present Worth:	>$3,037,600

Expected Outcome of the Alternative:

- Hydraulic containment of the source area contamination and 75% reduction in volume.
- Remediation goals will take in excess of 30 years to attain.
- Institutional controls must stay in effect and long-term monitoring must continue indefinitely.

J. COMPARATIVE ANALYSIS OF ALTERNATIVES

Each of the remedial alternatives described above were evaluated using the following nine evaluation criteria set forth in the NCP (see 40 CFR 300.430 (e)(9)):
(1) Overall protection of human health and the environment;
(2) Applicable or relevant and appropriate requirements (ARARs);
(3) Long-term effectiveness and permanence;
(4) Reduction of toxicity, mobility, or volume through treatment;
(5) Short-term effectiveness;
(6) Implementability;
(7) Cost;
(8) State/Support Agency acceptance; and
(9) Community Acceptance

The strengths and weaknesses of each alternative was weighed against the other to identify the alternative providing the best balance among the nine criteria. These nine criteria are separated into three categories: threshold criteria (1-2); primary balancing criteria (3-7); and modifying criteria (8-9). A description of each criterion and associated evaluation of the alternatives for the Site is provided below.

1. Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

All of the alternatives are protective of human health and the environment, under current conditions; however, if current Site conditions were to change, (i.e., contamination plume migrating to areas not currently serviced by the Dublin Borough Drinking Water System), then some of the alternatives would no longer be protective of human health and the environment and would require additional remedial action. Alternative 2 requires a thorough long-term monitoring plan and additional institutional controls to further ensure overall protection of human health and the environment, as compared to alternative 1.

Although alternatives 1 and 2 provide protection of human health and the environment under current plume conditions, neither alternative eliminates future risk to human health and the environment. Future risks include movement of the plume to areas not currently contaminated or an increase in contamination levels in areas that are currently contaminated below action levels. Alternatives 3 through 8A attempt to protect human health and the environment for future conditions through the use of treatment technologies which would attempt to remediate the contamination. Alternatives 1, 2 and 6 may have the potential for MCL exceedance at the receptor wells downgradient of the OU1 supply well. Modeling shows that the plume may migrate for these alternatives. Alternative 7 has the potential to approach MCLs at the receptor wells downgradient, due to migration of the plume. Alternative 5 is predicted to result in increased lateral spread of the contaminant plume to areas beyond the current public water distribution system.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Section 121 (d) of CERCLA and the NCP at 40 CFR § 300.430(f)(l)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA section 121 (d)(4).

"Applicable" requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. "Relevant and appropriate" requirements are those requirements that, while not legally "applicable", address problems or situations sufficiently similar to those encountered at the site and that their use is well-suited to the particular site. Only those State standards that are promulgated, are identified by the State in a timely manner, and are more stringent than federal requirements may be applicable or relevant and appropriate. The term "promulgated" means that the standards are of general applicability and are legally enforceable.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statues or provides a basis for invoking a waiver.

The chemical specific ARARs apply to all the alternatives. Alternatives 1, 2, and 6 have the potential to exceed MCLs (40 C.F.R. §§ 141.11-12 and 141.61-62), which would be a violation of the Safe Drinking Water Act (SDWA). Alternatives 4C, 7, 8 and 8A may require a direct discharge of treated groundwater to surface water, therefore, they must meet the location specific ARAR, Pennsylvania Wetlands Regulations (25 PA Code Chapter 105.18). The discharge associated with alternatives 4C, 7, 8, and 8A may require meeting National Pollution Discharge Elimination System (NPDES) requirements, an action specific ARAR for water. These alternatives can be designed to meet or exceed NPDES requirements, therefore, complying with the Clean Water Act (CWA). Alternatives 4C, 7, 8 and 8A must also meet the action specific ARARs for air. Alternative 4C, 6, 7, 8, and 8A must meet the action specific ARARs for hazardous waste and residual waste. Alternatives 6 and 8A may be required to meet the action specific ARAR for re-injection, which is referenced in the NPDES requirements . Table 8 identifies each ARAR, the associated legal citation, and the classification.

Table 8
Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBCs) Material for the Dublin TCE Superfund Site

ARAR or TBC	Legal Citation	Classification	Summary of Requirement
I. Chemical Specific			
1. Safe Drinking Water Act: Maximum Contaminant Levels (MCLs)	40CFR §§141.11-12 and 141.61-62	Relevant and Appropriate	MCLs are enforceable standards for public drinking water supply systems which have at least 15 srevice connections or are used by at least 25 persons. MCLs are relevant and appropriate requirements which were considered in establishing groundwater cleanup levels.
2. Pennsylvania Land Recycling and Environmental Remediation Standards Act (Act 2 Program)	25 PA Code Chapter 250	TBC	This regulation establishes requirements for voluntary cleanup activities.
3. Pennsylvania Water Quality Standards	25 PA Code Chapters 16 Subchapter B, Appendix A, 93.4a, 93.6-93.7, 93.8a, and 95.2	Relevant and Appropriate	These are guidelines established pursuant to Section 304 of the Clean Water Act that set the concentrations of pollutants which are considered adequate to protect human health based on water and fish ingestion and to protect aquatic life. Ambient water quality criteria may be relevant and appropriate to CERCLA cleanups based on the uses of a water body.

4. Integrated Risk Information System (IRIS)	EPA Office of Research and Development	TBC	IRIS is an EPA data base containing up-to-date health risk and EPA regulatory information for numerous chemicals. IRIS is the preferred source of toxicity information as it contains only those reference doses (RfDs) and cancer slope factors that have been verified by the RfD or Carcinogen Risk Assessment Verification Endeavor Workgroups.	These non-enforceable toxicity values have been considered while developing site-specific cleanup standards for each remedial alternative.
II. Location Specific				
1. Pennsylvania Wetlands Regulations	25 PA Code Chapter 105.18a	Applicable	Protects wetlands of the State from dredging, filling, removal, or other alteration and requires State oversight and approval.	This regulations shall be applicable if discharge to surface water has an adverse effect on wetlands.
111. Action Specific				
A. Water				
1. Clean Water Act (CWA); Pennsylvania National Pollutant Discharge Elimination System Requirements	40 CFR 122.41-122.50, 25 PA Code Chapters 91.51, 92, 93.4, 93.6-93.7, 93.8a, and 16 Subchapter B. Appendix A.	Applicable	Establishes effluent limitations for discharges to waters of Pennsylvania and the United States.	The groundwater treatment plants will comply with these discharge standards.
2. Storm Water Act Management	32 P.S. § 680.13	Applicable	Requires implementation of stormwater control measures to prevent injury to health, safety, or property.	Storm water shall be managed to control stormwater during construction of the remedy.
3. Erosion and Sediment Control	25 PA Code 102.11 'and 102.22	Applicable	Requires preparation of an erosion and sediment control plan for activities involving land clearing, grading and other earth disturbances and establishes erosion ans sediment control criteria.	These regulations apply to construction activities at the Site which disturb the ground surface, including clearing, grading and excavation. An erosion and sediment control plan will be submitted.

4. Underground Injection Control Program	**40** CFR Part **144.26**(a) **(1-5)**, **144.26**(b) (I) (iii) (G), **144.26**(b) **(2)**(ii-x), **144.27, 144.82,** and **144.84.**	Applicable	Establishes classes of injection wells and establish requirements for the Underground Injection Control Program.	These regulations apply to the in-situ portion of the remedy, which requires injection of an oxidant into the aquifer..
1. Air Emission Standards for Process Vents	**40** CFR Part **264.1030- 264.1034 and 40 CFR** Part **264.1053 - 264.I063**	Relevant and Appropriate	Establishes requirements for process vents and equipment leaks.	Emission due to leaks from the treatment plant would comply with this requirement.
2. Federal Regulations Governing Hazardous Air Pollutants (NESHAPS)	**40** CFR **61.242-1** through **61.244**	Applicable	Requires emission of Hazardous Air Pollutants (HAPs) from new and existing sources to be quantified; establishes ambient air quality standards and emissions limitations for HAP emissions from new sources.	Emission from the treatment plant would comply with this requirement.
3. Control of Air Emissions from Air Strippers at Superfund Groundwater Sites, June 15, 1989	OSWER Directive **9355.0-28**	TBC	This policy guides the selection of control for air strippers at groudwater sites according to the air quality status of the area of the Site (i.e., whether it is an attainment or non-attainment area).	This policy shall be considered in determining if air emission controls are necessary for the air stripper. Sources most in need **of** the controls are those with emission rates in excess of **3** lbs/hour or **15** lbs/day or a potential rate of 10 tons/year of total VOCs.
4. Ambient Air Quality Standards for Particulate Matter	**25** PA Code Chapter **123.1 - 123.2**	Applicable	Establishes fugitive dust regulations for particulate matter.	The construction associated with the remedy will comply with these regulations.
5. Pennsylvania Point Source Program	**25 PA** Code Chapters **123.1 - 123.3, 124.7, 123.31, 123.41. 127.1, 127.11, 127.12, and 131.1 - 131.4**	Applicable	Requires all new air emission sources to achieve minimum attainable emissions using best available technology.	Emissions for the groundwater treatment plant would comply with this requirement.

3. Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. This criterion includes the consideration of residual risk that will remain on-site following remediation and the adequacy and reliability of controls.

Each alternative provides some degree of long-term protection. The alternatives vary in effectiveness of assuring protection against potential exposure based on the components of the alternative and their effectiveness in remediating the contamination. The effectiveness of alternatives 1 and 2 are dependent on the contamination plume not migrating and the adequacy of the long-term monitoring program and institutional controls. Alternative 2 will be designed with a more comprehensive monitoring program than the one already instituted at the Site, therefore, alternative 2 is more effective than alternative 1. Alternative 3 may provide a slightly great degree of long-term effectiveness and permanence, than the first two alternatives, since there is minimal treatment associated with this alternative. Alternative 4 provides some source control and remediation, however, it does not actively remediate the dissolved plume through treatment. Alternative 4C would provide a greater degree of effectiveness than alternative 4, because hydraulic control of the source area would be achieved, but again the dissolved plume would not be remediated through treatment. Alternative 5 would provide a comparable degree of effectiveness and permanence to alternative 3. The dissolved plume is treated in Alternative 5, but the source area is neither treated nor contained. Alternative 6 provides some degree of long-term effectiveness and permanence because it reduces the volume of the source material. Alternative 7 is more effective than alternatives 1 through 6 because it hydraulically contains the source area contamination and remediates the dissolved plume through treatment. Alternative 8 is more effective than alternative 7, due to the greater volume of groundwater treated in the dissolved plume. Alternative 8A should be the most effect in the long-term because it has volume reduction of the source, and provisions for hydraulic containment of the source and remediation of the dissolved plume, if required.

Reviews at least every five years, as required, would be necessary to evaluate the effectiveness of any of these alternatives.

4. Reduction of Toxicity, Mobility or Volume

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternatives 1 and 2 do not include treatment as a component of the remedy. Therefore, these alternatives would not reduce the toxicity, mobility or volume of contamination at the Site, except that which would happen through natural attenuation.

Alternatives 3 and 5 provide a slight reduction of toxicity, mobility or volume of the groundwater contamination due to the increased pumping rates at the OU1 supply well and downgradient pumping. Alternative 4 achieves limited source control, thereby slightly reducing the mobility and volume of the source area contaminants. The treatment associated with this alternative will result in a limited reduction of toxicity. Alternatives 4C, 7, 8 and 8A all achieve complete hydraulic containment of the source material and, therefore, are more effective at reducing the mobility and volume of contaminants. Alternatives 8 and 8A reduce the toxicity of the dissolved plume within the shortest timeframe. Alternative 6 would not fully control the source, but it is predicted to reduce the source strength contamination by at least 75 percent, as would alternative 8A.

Alternative 8A provides greatest reduction of toxicity, mobility and volume of all the alternatives. The volume of contamination would be reduced by at least 75 percent, hydraulic containment would limit the mobility of the source area contamination, if remediation goals were not obtained through the in-situ technology, and treatment of the dissolved plume would reduce the toxicity of the contamination.

5. Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.

Alternatives 1 and 2 have the best short term effectiveness because they are either already implemented or can be implemented in a short time frame. Since alternative 2 is a component of all the other alternatives, all the alternatives satisfy this criteria to some extent. Alternative 3 is considered good in terms of short-term effectiveness because the only minor modifications to the existing OU1 recovery/treatment system are required for implementation of this alternative. Alternatives 4, 4C, 5, 7, and 8 have less favorable short-term effectiveness due to the need to pump and treat the dissolved plume for an extended period of time. Alternative 8A has the best short-term effectiveness of the alternatives that try to achieve the goal of returning the aquifer to beneficial use. The first phase of alternative 8A is currently being studied and can be implemented quickly. The in-situ treatment should achieve some hydraulic containment of the source area plume while reducing the volume of contamination. While the first phase is in operation, the next phases can be designed and implemented, if required.

Groundwater modeling has estimated that all of the alternatives which require treatment of the plume will require in excess of 30 years to reach cleanup standards.

6. Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered. Alternative 1 has already been implemented. Alternative 2 can be easily implemented by revising the long-term monitoring program and implementing a deed notice on the 120 Mill Street property. The implementation of Alternative 3 would also be easy because the OU1 system has been designed to accommodate the increased pumping associated with this alternative. Alternative 5 would be slightly more difficult to implement than alternative 3 because a downgradient well would need to be installed. Alternative 4 can be implemented within a reasonable timeframe because source area wells already exist and the discharge can be accommodated at the POTW. Alternatives 4C, 7 and 8 are considered progressively more difficult to implement because of the increasing number of wells and the need to construct a collection/conveyance system to treat and discharge the water. Alternative 8A will be implemented using a phased approach. The first step in the phased approach will be to initiate the in-situ portion of the cleanup which should contain the source material and reduce the volume of contamination. Currently, an in-situ field pilot test is being conducted to determine the implementability of in-situ treatment in fractured bedrock. The results of this pilot test have been favorable to date and will determine the implementability of alternative 6 and the in-situ portion of alternative 8A. A Pre-Remedial Design Investigation will be conducted as part of alternative 8A to evaluate the benefits of pumping and treating the dissolved plume. If the Pre-Remedial Design Investigation indicates the dissolved plume pump and treat portion of alternative 8A is required, implementability will depend on the final design.

7. Costs

The estimated 30 year present worth for the alternatives range $0 to $4.1 million for alternative 8. The cost of alternatives 7, 8, and 8A are variable because they are based on an estimated cost for acquiring property to install recovery wells and a conveyance system. The cost of alternative 8A was calculated using an estimated number of wells and assuming that the contingent portion of the remedy is used; however, the optimal design, based on a Pre- Remedial Design Investigation, will determine the exact number of wells used in both the source area and the dissolved plume, if required. The estimated cost of each alternative increases as the degree of treatment increases. The estimated present worth cost for all the alternatives, except the No Further Action alternative, are presented in Table 9.

Table 9 Cost Comparison of Alternatives			
Alternatives	Capital Costs	Operations and Maintenance	30-year Present Worth
2	$0	$65,900	$362,800
3	$21,600	$78,900	$465,100
4	$87,900	$191,500	$1,230,000
4C	$105,200	$155,500	$1,023,900
5	$71,100	$82,700	$538,100
6	$264,800	$65,900	$627,600
7	$636,500	$176,300	$1,684,300
8	$2,807,200	$215,700	$4,099,400
8A	$1,644,400	$234,210	$3,037,600

NOTE: A 7% discount rate was used to determine the Present Worth.

8. State Acceptance

The Commonwealth of Pennsylvania has reviewed, commented, and concurred with the selected remedy described in this ROD.

9. Community Acceptance

On June 15, 2001, pursuant to section 113 (k)(2)(B)(i)-(v) of CERCLA, 42 U.S.C. § 9613 (k)(2)(B)(i)-(v), EPA released for public comment the Administrative Record and the Proposed Plan setting forth EPA's Preferred Alternative for the Dublin TCE Superfund Site. EPA made these documents available to the public in the Administrative Record located at the EPA Region III offices in Philadelphia, PA, and at the Dublin Borough Hall, Dublin, PA. The Proposed Plan was released to the public on June 15, 2001. The notice of availability for the RI/FS and Proposed Plan was published in the *Montgomery County Record, Doylestown Intelligencer* and the *Courier Times* on June 15, 2001. A 30-day comment period began on June 15, 2001, and was initially scheduled to conclude on July 14, 2001. By request of Rouse Chamberlin Ltd., Sequa Corporation, and Dublin Borough, the public comment period was extended until August 30, 2001. The notice to extend the comment period was published in the *Montgomery County Record, Doylestown Intelligencer* and the *Courier Times* on July 12, 2001. A second request by Dublin Borough, extended the comment period to September 28, 2001. The second notice to extend the comment period was published in the *Montgomery County Record, Doylestown Intelligencer* and the *Courier Times* on August 30, 2001.

A public meeting to discuss the Proposed Plan was held during the public comment period on June 27, 2001. At the meeting representatives from EPA answered questions about the Site and the remedial alternatives under consideration. Approximately 20 people attended the meeting, including residents from the impacted area, potentially responsible parties, township officials, and news media representatives. A summary of comments received during the comment period and EPA's responses are contained in the Responsiveness Summary, Part III of this document.

K. PRINCIPAL THREAT WASTES

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP §300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in groundwater may be viewed as source material. The Dublin TCE Superfund Site has been characterized as having NAPLs in the Source Area, which is located in the vicinity of the Fire Tower Well, because the concentration of the TCE is very high (>10,000 µg/l). To address these principal threat wastes, the selected remedy includes in-situ treatment to reduce the volume of the source material and a contingency for hydraulic containment of the source area.

L. SELECTED REMEDY

1. Summary of Rationale for the Selected Remedy

EPA has selected this remedy because it provides the best attainment of the RAOs discussed at Section H. In addition, the selected remedy provides the best balance when evaluated using the Primary Balancing Criteria. By utilizing both in-situ treatment and possibly hydraulic containment of the source area if required. Alternative 8A will provide the best combination of treatment to achieve reduction of toxicity, mobility, and volume of the contamination. The Selected Remedy will be implemented in a phased approach to minimize implementation obstacles and to optimize the design for both short and long-term effectiveness.

2. Detailed Description of the Selected Remedy

EPA's selected remedy is a modified and combined version of alternatives 6 and 8. The selected remedy was developed by EPA and modified based on comments received during the comment period of the Proposed Plan. The selected remedy consists of the following key components:

a) **Incorporate all the components of alternative 2:** This includes institutional controls which would permanently limit the 120 Mill Street property to commercial/industrial land use with no residential use in the future. The facility property shall be subject to a perpetual deed restriction which would limit the use to commercial/industrial uses. The deed restriction would be executed by the property owner. The EPA has also sent a request to Dublin Borough to limit the 120 Mill Street property to industrial use only in next revision to the Borough's Comprehensive Plan. Groundwater use for the 120 Mill Street property would also be restricted through the deed and would supplement the restrictions on groundwater use that are imposed by Dublin Borough Ordinances #164 (as amended by #219) and #200. A comprehensive long-term monitoring plan, for protection of human health and to evaluate remedy performance/plume migration, would be designed and implemented.

b) **Pre-remedial design investigation:** A pre-remedial Design Investigation to optimize all the components of the remedy will be conducted. This will include pilot testing and design of the in-situ treatment system, the source containment pump and treat system, if required, as well as, further investigation of the dissolved plume. The goal of the investigation of the dissolved plume will be to collect data about the plume to fully understand its movement, and its response to the remedial actions in the source area. The investigation will provide information to assess the need and/or design of treatment for the dissolved plume.

c) **In-situ treatment of the source area contamination:** The use of in-situ technologies to reduce the source material is being investigated as a method to significantly reduce the volume of source material. It is anticipated that using chemical oxidation, the volume of source material in the vicinity of the Fire Tower Well can be reduced by at least 75%. Currently, a field pilot test is being conducted to assess the effectiveness of different technologies. This investigation will provide the design basis for this portion of the Selected Remedy. If, within three years from the date of this ROD, remediation goals have not been met nor successfully demonstrated that they will be met using the in-situ technology, the contingency pump and treat will be implemented.

d) **Pump and treat 1-4 source area wells at a total of 20 gpm, if remediation goals are not achieved by the in-situ technology:** The primary objective of this portion of the selected remedy is to attain hydraulic containment of the NAPL portion of the contamination. If the in-situ treatment of the source area does not achieve cleanup to risk based levels of 5 µg/l for TCE, hydraulic containment of the source area will be implemented. The FS modeling identified 20 gpm to be the pumping rate needed to achieve hydraulic containment of the source materials. The number of wells required to effectively achieve hydraulic containment will be determined during a Pre-Remedial Design Investigation, if this portion of the remedy is implemented. The recovered groundwater will require treatment, most likely through the use of air stripping, prior to discharge. The treated effluent from the source area wells may be discharged to the Dublin Borough Municipal storm sewer system and/or to another suitable discharge point as identified during a Pre-Remedial Design Investigation.

e) **Pump and treat downgradient wells at 5 gpm each:** This portion of the remedial action focuses on minimizing or eliminating contaminant migration of the dissolved plume and restoring the aquifer to drinking water standards. This portion of the remedy will be implemented if the investigation of the dissolved plume identifies the need.

f) **Increase Pumping of the OU1 Supply Well:** This portion of the remedial action may be needed to prohibit the dissolved plume from migrating. This portion of the remedy will be implemented if the investigation of the dissolved plume identifies the need. This portion of the remedial action will not be implemented if the investigation determines that the OU1 Supply Well cannot sustain an increase in pumping due to drought or other groundwater conditions.

g) **Phased in approach to remedial action:** A phased in approach will be used to implement the selected remedy. The first step in the phased in approach will be to implement the in-situ portion of the remedy. The investigation of the dissolved plume will take place during the design, implementation, and operation of the in-situ phase of the remedy.

3. Estimate for the Selected Remedy

The information in the cost estimate is based on the best available information regarding the anticipated scope of the selected remedy. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedy. The cost of the selected remedy was calculated using an estimated number of wells (8 wells distributed between the Source Area and downgradient). The cost estimate is based on implementing the contingency action of pumping and treating the source area. If the in-situ treatment attains remediation goals, the contingency action will not be required. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD Amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

The estimated cost of the selected remedy, which includes capital, operation and maintenance, and present worth is approximately $3,037,600. A detailed presentation of these costs is provided in Table 10.

Table 10
Estimated Costs for the Selected Remedy

Cost Item	Quantity/Unit	Unit Cost	Total Cost
Capital Costs:			
Site Preparation	1 lump sum	$3,500	$3,500
Piping and Connections	1 lump sum	$8,000	$8,000
Equipment Installation/Setup	1 lump sum	$9,000	$9,000
Pre-packaged Air Stripping System	2 each	$40,000	$80,000
Manganese Sequestering System	2 each	$2,500	$5,000
Well Installation	7 each	$15,000	$105,000
Well Pumps	8 each	$2,500	$20,000
Electric to Well Pumps	8 each	$5,000	$40,000
Piping to Treatment System (Based on 500 linear ft/well)	4,000 linear ft	$20	$80,000
Vapor Phase GAC System	2 each	$4,000	$8,000
Discharge Piping to Existing Sewer	200 linear ft	$12	$2,400
Manhole at Tie-in Location	2 each	$4,000	$8,000
Property Access (1.5 acres/well)	10.5 acres	$55,000	$577,500
		Subtotal:	$946,400
Injection (@ 3 packed Intervals)			
Mobilization and Setup	1 lump sum	$2,500	$2,500
Labor (2-person crew)	14 day	$1,200	$16,800
Equipment Rental, Expenses	1 lump sum	$16,800	$16,800
Potassium Permanganate	12,000 pound	$2	$24,000
Demobilization	1 lump sum	$500	$500
		Subtotal:	$60,600
Sampling (3 DGWs, pre- and post-injection sampling)			
Labor (2-person crew)	2 day	$1,200	$2,400
Equipment Rental, Expenses	2 lump sum	$1,100	$2,200

Table 10 Estimated Costs for the Selected Remedy			
Cost Item	**Quantity/Unit**	**Unit Cost**	**Total Cost**
Laboratory Analysis	10 each	$250	$2,500
Reporting	1 lump sum	$1,000	$1,000
		Subtotal:	$8,100
		Capital Costs Subtotal:	$1,015,100
		Contingency (20%):	$203,020
		Subtotal:	$1,218,120
		Administration & Permits (5%):	$60,900
		Legal (5%):	$60,900
		Engineering (25%):	$304,500
		Total Capital Costs:	$1,644,400
Annual O & M Costs:			
Chemical Usage Sequestering Solution	260 gallons	$20	$5,200
Air Stripper Maintenance	2 lump sum	$1,500	$3,000
System Operator Monitoring	120 hours	$60	$7,200
VPGAC Change-out w/disposal	7000 pounds	$3	$21,000
Equipment Replacement	2 lump sum	$3,500	$7,000
Electrical Costs	97,950 kilowatt-hour	$0.10	$9,795
Stripper Effluent Sampling	12 events	$800	$9,600
NPDES Outfall Sampling	4 events	$1,000	$4,000
		Subtotal:	$66,795
		Contingency (20%):	$13,360
		Subtotal:	$80,155
		Reporting & Administration (5%):	$4,000
		Total Annual O & M Costs:	$84,155
Groundwater Monitoring Costs (per event)			
Labor (2-person crew)	7 day	$1,200	$8,400

Table 10 Estimated Costs for the Selected Remedy			
Cost Item	**Quantity/Unit**	**Unit Cost**	**Total Cost**
Equipment Rental Expenses	1 lump sum	$3,860	$3,860
Laboratory Analysis	20 each	$250	$5,000
Reporting	1 lump sum	$1,000	$1,000
		Event Total:	$18,300
Years 1 through 5 (semi-annual frequency)			
Annual Sampling Event	2 each	$18,300	$36,600
		Contingency (20%):	$7,300
		Total:	$43,900
Years 6 through 30 (annual frequency)			
Annual Sampling Event	1 each	$18,300	$18,300
		Contingency (20%):	$7,300
		Total:	$22,000
SUMMARY OF ESTIMATED COSTS			
Capital Costs			$1,644,400
Annual O & M Costs			$84,155
Annual Sampling (Years 1-5)			$43,900
Annual Sampling (Years 6-30)			$22,000
30-Year Net Present Value (@ 7% Discount)			≥$3,037,600

4. Expected Outcomes of the Selected Remedy

Potable drinking water is already being supplied by the successful implementation of the ROD for OU1. The selected remedy will return the groundwater to drinking water standards. The length of time necessary to return the groundwater to drinking water standards is estimated to be in excess of 30 years.

The selected remedy for the Site will allow for the continued use of the 120 Mill Street as an industrial property during design and construction of all the portions of the selected remedy. The anticipated time for implementation of the in-situ treatment portion of the selected remedy is 3 to 6 months. If hydraulic containment of the source area is required, its implementation may take 1 to 2 years.

The manganese observed in groundwater at the Site is probably directly related to the high concentrations of TCE in groundwater. TCE can cause naturally-occurring manganese to leach from geologic formations. Removing the TCE from the groundwater should cause a reduction in manganese, as well as, chloroform levels. Table 11 identifies the cleanup level for the TCE.

Table 11 Cleanup Level for Contaminants of Concern		
Chemical	**Concentration Limits (ug/l)**	**Source**
Trichloroethylene	5	MCL
The cleanup level for trichloroethylene is based on the MCL for drinking water. Treatment shall be monitored to ensure that cleanup levels are achieved. The groundwater is expected to be available for unrestricted use as a result of the remedy.		

Performance Standards

Further detailed requirements and Performance Standards associated with the selected remedy are presented below.

1. The remedy will comply with all federal and state ARARs listed in Table 8.
2. All areas impacted by the construction activities during remedy implementation shall be graded, restored and revegetated to the extent practicable.
3. Wastewater generated during decontamination activities shall be properly managed in accordance with State and Federal Laws.
4. Groundwater Treatment Systems shall comply with the following:
   A) The groundwater at the site shall be extracted and treated until the cleanup standards for all contaminants of concern are achieved for twelve (12) consecutive quarters of sampling.
   B) The treatment system shall reduce the contaminants in the extracted groundwater unattended, on a continuous, 24-hour-per-day basis. The final pumping rate of the extraction wells and the number of wells shall be determined during remedial design. Final design criteria for the treatment systems will be determined in the remedial design phase.

5. Maintenance and Monitoring Plan:

A) The groundwater extraction and treatment system, Site monitoring wells, and all other remedial action components shall be operated and maintained in accordance with an Operation and Maintenance plan to be developed for this remedial action. The Operation and Maintenance plan shall ensure that all remedial action components operate within design specifications and are maintained in a manner that will achieve the Performance Standards. The Operation and Maintenance plan shall be updated from time-to-time as may be necessary to address additions and changes to the remedial action components.

B) A long-term groundwater monitoring program shall be implemented to evaluate the effectiveness of the treatment system and other remedial action components in reducing contamination in the groundwater to achieve the Performance Standards and to ensure that the contamination does not migrate to areas where groundwater was not previously contaminated. The long-term groundwater monitoring program will provide for the sampling and analysis of groundwater from Site monitoring wells, the maintenance of Site monitoring wells, and for, among other things, the following:

(i) The influent and effluent from the treatment facilities shall be sampled a minimum of once per month and analyzed for each contaminant for which a Performance Standard will be established consistent with the law.

(ii) Sampling from and operation/maintenance of the monitoring wells and groundwater extraction/treatment system shall continue until such time when EPA, in consultation with PADEP, determines that groundwater treatment is no longer necessary as set forth herein.

(a) EPA, in consultation with PADEP, shall determine whether the Performance Standard for each contaminant for which a Performance Standard has been provided in Table 11, has been achieved throughout the entire area of groundwater contamination. Following any such determination, the monitoring wells shall continue to be sampled for twelve (12) consecutive quarters (the "Confirmation Period").

(b) If any contaminant is detected in groundwater at a concentration above the Performance Standard at any time during the Confirmation Period, the Confirmation Period shall end and sampling and operation/maintenance of the monitoring wells and extraction/treatment system shall continue. EPA, in consultation with PADEP, shall again determine whether the Performance Standard for each contaminant for which a Performance Standard has been provided in Table 11, has been achieved throughout the entire area of groundwater contamination as described in Paragraph (ii)(a), above.

(c) If EPA, in consultation with PADEP, determines at the close of the Confirmation Period that no Table 11 contaminant has been detected in groundwater at a concentration above the Performance Standard at any time during the Confirmation Period, the extraction/treatment system shall be shut down. Annual monitoring of the groundwater shall continue for five years after the groundwater extraction/treatment system is shutdown. If, subsequent to an extraction/treatment system shutdown, annual monitoring shows any Table 11 contaminant is detected in groundwater at a concentration above the Performance Standard, the extraction/treatment system shall be restarted and operated/maintained. EPA, in consultation with PADEP, shall again determine whether the Performance Standard for each contaminant for which a Performance Standard has been provided in Table 11, has been achieved throughout the entire area of groundwater contamination as described in Paragraph (ii)(a), above.

(d) The extraction/treatment and monitoring system may be modified, as warranted by performance data during operation, to achieve Performance Standards. These modifications may include alternate pumping of extraction well(s) and/or the addition or elimination of certain extraction wells.

(iii) Existing pumping and/or monitoring wells which EPA determines during long-term monitoring to serve no useful purpose shall be properly plugged and abandoned consistent with PADEP's Public Water Supply Manual, Part II, Section 3.3.5.11. Wells which EPA determines are necessary for use during the long-term monitoring program will not be plugged.

6. A statutory Five-Year Review was completed for Dublin TCE on February 10, 2000. This review was triggered by the construction of the alternate water supply required by the ROD for Operable Unit One. The remedy selected in this ROD will not, upon completion, leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure; however, the remedy will require five years or more to complete. Therefore, EPA will continue to conduct Five-Year Reviews until they are no longer required in accordance with Section 121(c) of CERCLA. The next review will be conducted by February 10, 2005 to ensure that the remedy is, or will be, protective of human health and the environment. Such reviews shall be conducted in accordance with the guidance.

7. Institutional Controls - Institutional controls shall be implemented to protect the integrity of the groundwater treatment system during implementation of the remedial action and operation and maintenance. At a minimum, these controls shall ensure that no construction, excavation, or regrading takes place in these areas except as approved by EPA.

8. Erosion and sediment controls and temporary covers will be installed to protect exposed soil from the effects of weather consistent with PADEP's Bureau of Soil and Water Conservation Erosion and Sediment Pollution Control Manual and the Bucks County Soils Conservation policy. Erosion potential shall be minimized. Further controls in the form of Site grading to improve land grades, cover soils, vegetation, and drainage channels to reduce erosion potential from surface runoff may be required to minimize erosion. The

extent of erosion control necessary will be determined by EPA, in consultation with PADEP, during the remedial design phase.

M. STATUTORY DETERMINATIONS

Under Section 121 of CERCLA, the lead agency must select remedies that are: protective of human health and the environment; comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified); are cost-effective; and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element. The following sections discuss how the selected remedy meets these statutory requirements.

1. Protection of Human Health and the Environment

Groundwater at the Site is currently protective of human health and the environment as a result of the implementation of the ROD for OU1. The ROD for OU1 required that potable water be provided by extending the service of the Dublin Borough municipal supply system to all residents within the plume of groundwater contamination. Future risk still exist, due to the groundwater still being contaminated. The estimated risks associated with residential exposure to groundwater were calculated and determined to be above the acceptable HI of 1 for both adult and child receptors. The ELCR estimates are above EPA's target risk range for both the adult and child receptor.

The exposure levels associated with future groundwater use will be addressed through treatment, in-situ chemical oxidation and groundwater pump and treat, in the selected remedy. The exposure levels associated with the groundwater will be reduced to protective ARAR levels or within EPA's generally accepted risk range of 10^{-4} to 10^{-6} for carcinogenic risk and below a HI of 1.

2. Compliance with and Attainment of Applicable or Relevant and Appropriate Requirements

The selected remedy will comply with all applicable or relevant and appropriate chemical-specific, location-specific and action-specific ARARs. Table 8 provides a list and description of all ARARs for the alternatives outlined in this ROD.

3. Cost-effectiveness

In the lead agency's judgement, the selected remedy is the most cost-effective alternative and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP § 300.430(f)(1)(ii)(D)). This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence this alternative represents a reasonable value for the money to be spent.

The estimated 30-year present worth cost for the selected remedy presented in this ROD is $3,037,600. This cost was determined assuming the contingency portions of the remedy would be implemented, therefore, the cost could be less if the contingency portion is not used. Although there are other alternatives that treat the contamination that are less expensive, the selected remedy provides a far greater reduction in mobility and volume for only a slight increase in cost. Table 9 compares the costs of all the alternatives evaluated.

4. Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and considering State and community acceptance.

The selected remedy satisfies the criteria for alternative treatment technologies through in-situ treatment of the source area contamination. The in-situ treatment will permanently reduce the volume of contamination in the source area by approximately 75%. The remedy is the best balance between long-term effectiveness, implementability and cost. Although Alternative 8 may be the most aggressive cleanup of the dissolved plume, the selected remedy combines alternative treatment in the source area with pumping in the dissolved plume, if required, for a more effective remediation, which should be less costly and easier to implement. The remedy does not present short-term risks different from the other treatment technologies.

5. Preference for Treatment as a Principal Element

By treating the contaminated groundwater using in-situ chemical oxidation and possibly groundwater pump and treat, the selected remedy addresses principal threat wastes posed by the Site through the use of treatment technologies. By using treatment as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied.

6. Five-Year Review Requirements

A statutory Five-Year Review was completed for Dublin TCE on February 10, 2000. This review was triggered by the construction of the alternate water supply required by the ROD for Operable Unit One. The remedy selected in this ROD will not, upon completion, leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure; however, the remedy will require five years or more to complete. Therefore, EPA will continue to conduct Five-Year Reviews until they are no longer required. The next review will be conducted by February 10, 2005 to ensure that the remedy is, or will be, protective of human health and the environment.

N. DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan identifying EPA's preferred alternative for the Site was released for comment on June 15, 2001. During the public comment period, EPA received numerous comments from the public regarding EPA's Proposed Remedy. These comments are presented in detail in Part III of this ROD, the Responsiveness Summary. Although EPA has not made any significant changes with regards to the Proposed Plan, the following changes have been made:

1. The Source Area pumping to achieve hydraulic containment has been modified to be a contingent portion of this remedy. The in-situ technology should achieve containment of the source material while it is in operation, therefore, the pumping would be redundant. If the remedial goals cannot be achieved by the in-situ technology, than the hydraulic containment through pumping would be implemented.

2. The pumping of the dissolved plume may be implemented only after a further study of the dissolved plume. During the comment period, EPA received comments regarding the amount of groundwater that would be extracted as part of the Selected Remedy. Dublin Borough requested that the amount of groundwater extracted be held to a minimum to effectively cleanup the plume, therefore, a comprehensive study of the dissolved plume and how it is effected by the remediation of the source is required before implementation.

3. The increased pumping of the OU1 Source well might not be implemented. A severe drought has occurred from the time the Proposed Plan was issued, therefore, increasing the pumping rate is impractical at this point. As part of the study of the dissolved plume, information will be gathered to determine if the pumping rate of the OU1 Supply well should be increased when practicable.

PART III

RESPONSIVENESS SUMMARY FOR THE PROPOSED REMEDIAL ACTION PLAN

AT THE

DUBLIN TCE SUPERFUND SITE

Dublin Borough, PA

Public Comment Period: June 15, 2001 - September 28, 2001

RESPONSIVENESS SUMMARY
DUBLIN TCE SUPERFUND SITE
COMMENTS ON THE PROPOSED PLAN

This Community Relations Responsiveness Summary is divided into the following sections:

Responses - Part One: This section provides a summary of major issues and concerns, and expressly acknowledges and responds to those raised by the local community at a public meeting held by EPA on June 27, 2001. "Local community" here means those individuals who have identified themselves as living in the immediate vicinity of this Superfund site, and or their elected officials, and are potentially threatened from a health or environmental standpoint. These may include local homeowners, businesses, the municipality, and potential responsible parties. Some of the responses to the comments contain additional information than what was provided during the public meeting.

Responses - Part Two: This section provides a comprehensive response to all significant written comments received by EPA. Where necessary, this section elaborates with technical detail on answers covered in Part One.

EPA's responses include clarification of the proposed remedy, and where appropriate, policy issues. It should be noted that the comments on the Proposed Plan have been considered and included in the Record of Decision, where appropriate.

Any points of conflict or ambiguity between information provided in Parts One and Two of this Responsiveness Summary will be resolved in favor of the detailed technical and legal presentation contained in Part Two.

Part 1 - Comments from Dublin TCE Superfund Site Public Meeting

A. Comments on the amount of water being extracted

Comment from Mr. Rodgers (resident) and others:

1. Comment: Mr. Rodgers was concerned about the amount of water to be extracted in the pump and treat portion of the remedy. He was concerned that the water would not be available for drinking water or if it was put back into the drinking water system after treatment it would still be contaminated. Several residents expressed approval for putting the treated water into the drinking water system.

Response: EPA is empathetic to the concerns of the borough and its residents that withdrawing a large volume of water from the aquifer could jeopardize the drinking water system. EPA understands that there have been water restrictions in the past and EPA proposes to perform further studies on the aquifer to determine the amount of water that can be extracted without effecting the drinking water supply.

If the treated water will be used as a supply for drinking water, EPA would tailor the treatment and testing to ensure safe drinking water.

Additional Response: EPA's response to "tailor the treatment" means for the design of a new system and/or a modification to the current OU1 supply well. If groundwater extraction and treatment is used as part of the remedial action, the system will be designed such that the effluent water meets all drinking water standards. If the

B. Comments on using treated water for drinking

<u>Comment from Mr. Shelmire (resident):</u>

1. Comment: What happens if the treated water is used for drinking water and it reaches above 5 ppm of TCE after treatment?

Response: EPA would turn off the system to perform maintenance or add more treatment, if necessary.

Additional Response: Drinking water would be obtained from other wells in the Dublin Borough drinking water system, if the contamination were to reach the OU1 supply well.

C. Comments on the remedial action design

<u>Comment from Mr. Cross (resident) and others:</u>

1. Comment: In alternative 8A, eight downgradient wells are proposed. Can you outline where those wells would be? Can you elaborate on the design?

Response: EPA cannot determine exactly where the wells, treatment buildings or piping would be located until a design investigation is completed. The wells would probably be located in the area between Main Street, Whistlewood and the OU1 supply well.

<u>Comments from Mr. Howard (Borough Solicitor):</u>

2. Comment: Is it possible that some of the wells may be located on private property?

Response: Yes, there is a possibility that wells would be located on private property.

3. Comment: As far as what type of criteria is going to be taken into consideration in determining where these wells are placed.

Response: The Pre-remedial Design Investigation will provide the information needed to design the system. The design will locate wells where they will be most effective, but also the least invasive for the residents. If wells need to be located on private property, it is EPA's policy to design them to be unobtrusive.

Comment from Mr. Harris (resident):

4. Comment: All these additional wells that you propose to be using, who is going to operate them and who is going to monitor them?

Response: That would be the responsibility of the responsible party if we were to enter into a consent decree to perform the remedial action at the Site with them. If the treated water was put back into the drinking water system, an agreement may be reached between the responsible party and the Borough to operate the system.

Comments from Mr. Kee (Borough Engineer):

5. Comment: What do you expect the Borough's duties to be in this cleanup program? Will the Borough have to pay for the extra pumping?

Response: The Borough should have no responsibility to cleanup the contamination. During the design process of the remedial action, the Borough can be as involved as they want. The Borough can decide to approve each step in the design process or to take a lesser role in the process.

The Borough should not incur any cost to remediate the Site. The money is set aside in a Superfund or the money from the responsible parties would cover their responsibilities, pay for the construction, operation and maintenance, and the continued monitoring of the system. It should not cost the Borough anything, except the cost of having your Borough Engineer and Solicitor review the information, but that is the cost of doing business.

Additional Response: The Borough can be involved in reviewing the design documents and providing comments. The approval of the design is the responsibility of the EPA.

The extra pumping referred to in the comment is that of the OU1 supply well, which is currently operated by the Borough. If it was determined that pumping in this well should be increased greater than 40 gpm, which is the standard pumping rate for the well, provisions for the increased cost to the Borough would be determined.

6. Comment: What role does the DRBC play for permits for pumping?

Response: The area is within the Delaware River Basin Commission (DRBC) restricted water area. EPA does not have to get a permit from the DRBC, but EPA does discuss its plan with the DRBC. (Note: In a letter dated July 31, 2001, DRBC states that "EPA is facilitating the mitigation project such that there is appropriate pump testing and hydrogeologic evaluation that demonstrates that, especially at modest quantities proposed for withdrawal, there should be low potential for interference with vicinity wells. Therefore, the EPA's proposed plan for the Dublin TCE Superfund Site applies design criteria that should not conflict with the DRBC's regulations....")

D. Comments on remediation technologies

Comment from Mr. Cross (resident):

1. Comment: If we don't clean this up what happens?

Response: The larger the groundwater plume, generally the harder it is to contain and cleanup. The longer it goes on, it spreads, and the more difficult it becomes to solve the problem.

Additional Response: If the Site is not remediated, the threat to human health and the environment will remain.

Comment from Mr. Shelmire (resident):

2. Comment: Do you feel 30 years will clean the contamination up?

Response: The thirty years is just an estimate and a basis to calculate the present worth costs. The actual time to remediate the plume will be based on the methods used and their effectiveness.

Comment from Mr. Moore (resident):

3. Comment: There is no way of pumping this water out, cleaning it and putting it back into the aquifer?

Response: The water can be pumped out treated and put back into the aquifer to reduce the concentration of contaminants at some locations. This process, reinjection, can be a very difficult in the type of geology that is found in Dublin Borough, fractured bedrock.

Comment from Mr. Cross (resident):

4. Comment: Putting cost aside, is there any mode of cleaning up this TCE?

Response: Basically, there are only two means of remediating TCE: 1) groundwater extraction and treatment; 2) and, in-situ treatment, both of which are proposed by EPA in the preferred remedy for the Site.

<u>Comment from Mr. Rodgers (resident):</u>

5. Comment: What is the worst case scenario? What if you can't cleanup the water and it moves?

Response: The responsible party is currently monitoring areas beyond the contamination to determine if the plume is migrating. If it is evident that contamination is moving to areas not previously contaminated, EPA will find some mechanism to provide clean drinking water to those effected.

E. Comments on the contamination

<u>Comment from Mr. Farring (resident):</u>

1. Comment: Is there a reservoir of contamination waiting to get into the aquifer or is it all in the aquifer now? Is it in the soil?

Response: In bedrock conditions, it is possible that contamination can be in a fracture and will eventually move to the aquifer. EPA looked at TCE levels in soil and subsurface soil. Not only did we calculate the risks associated with directly contacting the contamination in the soil, but we also examine the likelihood of TCE in the soil that could continue to impact the groundwater through migration. EPA did a comparison of the levels of TCE that we found in the soil at the Site to levels that we would expect to impact groundwater, and we found that the levels in the soil were pretty much negligible both in terms of direct contact with the soil and also in terms of acting as a continual source of contamination of groundwater.

<u>Comment from Mr. Kee (Borough Engineer):</u>

2. Comment: Is there a groundwater problem now? Why the deed restrictions on the Thompson property?

Response: The groundwater below the 120 Mill Street property is contaminated with TCE above MCLs. EPA does not want residential use on the 120 Mill Street property, primarily to prevent access to groundwater use. When EPA looked at soil at the Site a residential exposure scenario was examined. This scenario is that residents will come into contact with the soil for 30 years and at a given rate that corresponds to residential use. EPA examined the soil that was at the perimeter of the Site, because that soil is the closest to the residential areas. EPA did not look at direct contact of soil in the center of the Site for residents because of the restrictions placed on the 120 Mill Street property. The exposure of workers excavating the 120 Mill Street property was examined. The reason for the institutional controls is so that we don't have to worry about the property being converted into a residential community, which is a conservative approach to handling the risk.

Additional Response: The groundwater under the 120 Mill Street property is contaminated with TCE above the EPA action level.

Part 2 - Dublin TCE Superfund Site Response to Written Comments

A. Comment from Rouse Chamberlin developer of The Orchards, Dublin, PA, dated August 29, 2001:

1. Comment: Comments submitted pertain to the impacts of any remedial action on the residential properties of The Orchards. To the extent that remedial action facilities must be eventually placed on or near any residential properties, it is imperative that these facilities be designed and constructed to eliminate or greatly reduce their impacts on that property and neighboring properties.

Response: EPA will work with any parties responsible for implementing the response action at the Site to ensure that the principals of compatible design are followed. There are a number of informal EPA policies concerning the placement of such facilities that urge any parties responsible for response actions at a site to avoid placement in residential areas, unless there are no other reasonable alternatives available for the protection of human health and the environment in a manner consistent with the remedial action selected for the site. EPA prefers to have treatment facilities placed, to the extent feasible, in areas zoned for industrial or commercial use as opposed to residential use. If it were to prove necessary for EPA to place any treatment equipment, such as extraction wells, or structures on or near properties in The Orchards, these facilities could be designed to minimize visual, and other impacts from such equipment or facilities on residential property owners.

B. Comments from a concerned citizen:

1. Comment: Will the pumping from the contaminated wells lower the water table enough to dry-up my well?

Response: EPA understands the water supply problems previously encountered in Dublin Borough and the surrounding area. The Pre-Remedial Design Investigation will identify a pumping rate, a treatment method, and a disposition method for the treated water that will accomplish the Remedial Action Objectives without effecting private/public wells in the area. In response to the water supply concerns, EPA has modified the selected remedy. The pumping of the source area is now a contingency action to be implemented if in-situ treatment does not reach remediation goals. Also, the pumping of the dissolved plume will be phased in, if it is determined to be necessary, after further study of the dissolved plume.

2. Comment: Can a water tower be erected to hold the treated water for ultimate use by the Dublin Borough Municipal water distribution system?

Response: The Pre-Design Investigation will examine the feasibility of returning the treated water to the Dublin Borough Municipal water distribution system.

C. Comments from Duane Morris, Attorneys at Law on behalf of Dublin Borough:

1. Comment: The Proposed Plan does not analyze the effect on Borough water resources. The long-term effect of the remedy may be in direct conflict with the projected growth of the Borough and its need for additional water resources in the future. The Borough has obtained an increase in its water allocation to 230,000 gallons per day by the DRBC. However, the Borough, in the course of its future planning, and presumably, the DRBC, in granting the increase, never contemplated the extraction of sizeable quantities of contaminated groundwater that may simply be put to waste after treatment. The Proposed Plan offers no analysis of the effect of the pump and treat system on the underlying aquifer either now or in the future. While it is to be expected that the remedial design modifications will occur during the design process, it seems that basic questions regarding the feasibility of a proposed remedy should be addressed prior to that stage.

Response: See response to Part 2, B, #1 above.

Also, in a letter forwarding comments on the Dublin TCE Proposed Plan, dated July 31, 2001, DRBC states that "EPA is facilitating the mitigation project such that there is appropriate pump testing and hydrogeologic evaluation that demonstrates that, especially at modest quantities proposed for withdrawal, there should be low potential for interference with vicinity wells. Therefore, the EPA's proposed plan for the Dublin TCE Superfund Site applies design criteria that should not conflict with the DRBC's regulations...."

2. Comment: The Proposed Plan does not demonstrate the need for a pump and treat remedy. It is the Borough's understanding that pump & treat remedies are not highly effective where there is a non-aqueous phase solvent in a bedrock aquifer.

Response: EPA recognizes groundwater pump and treat as an acceptable remediation technique for TCE in bedrock, however, EPA has revised the Selected Remedy to utilize in-situ treatment as the primary treatment alternative. If remedial goals are not attained using the in-situ treatment, groundwater pump and treat will be implemented in the source area. EPA strives to return drinking water aquifers to beneficial use.

3. Comment: Where a contaminated groundwater plume has been shown to be actively moving toward private or public wells, a pump and treat solution could be justified, not because of the effectiveness of the treatment method, but rather due to the containment offered by intercepting the contaminated groundwater. The Borough's understanding of aquifer conditions is that contaminated groundwater movement is minimal, or, at least, not posing an imminent threat to other non-affected water resources. If this is true, then the need for significant, new, hydraulic controls is non-existent. If not, one would expect an exposition from USEPA as to the predicted movement of the plume. However, the plan offers no basis upon which to conclude that significant movement of the plume is occurring, movement that would justify such a significant increase in the pumping regime.

Response: The EPA does not agree that the plume is in steady state as stated in the FS. EPA's position is that the plume may not be in steady state because the vertical extent of the plume was never identified and information on the effects of the plume due to implementation of the ROD for OU1 was not available. EPA's selected remedy includes a detailed study of the dissolved plume to determine its characteristics.

4. **Comment:** The Borough would rather see the USEPA focus on long-term remedies that attack the source while protecting the region's limited water supply. It appears that the remedy mentions in-situ treatment as an after thought appended to the pump and treat remedy. The Borough supports any remedy that attacks the contaminant source.

Response: EPA has revised the Selected Remedy to utilize in-situ treatment as the primary treatment alternative; however, if such does not work, then a pump and treat remedy will be utilized. The in-situ treatment is an integral component of the entire remedy aimed at significantly reducing the source of contamination. The FS estimated that in-situ treatment could reduce the source contamination by 75% and EPA believed that this was a significant enough reduction in contamination to justify incorporating this treatment into the remedy. Additional information that has been collected since the FS has supported EPA's belief in the in-situ treatment . The implementation of the source area pump and treat system is contingent on the in-situ treatment reaching remediation goals.

5. **Comment:** The Proposed Plan does not consider the community acceptance of the remedy. As the USEPA knows from the public meeting, many residents have expressed concern over location of any additional extraction wells and the placement of piping that would be used to transport contaminated groundwater to a centralized treatment system.

Response: Please refer to the responses in Part 1, C and Part 2, A, #1. EPA prefers to place extraction wells and piping associated with remedial action in industrial or public areas.

6. **Comment:** There are concerns over the number of properties to be impacted and what measures could be taken in the event of a release of contaminated groundwater from the piping system. More to the point, who is ultimately responsible in the event of such a release, the Borough, the property owner, USEPA or the PRPs?

Response: The selected remedy will employ in-situ treatment as the first step to remediating the Site. This will effectively reduce the volume and toxicity of the most significantly contaminated groundwater. The threat of a release of contaminated groundwater during either the in-situ or the pump and treat phase of the remedy is minimal, but if it were to happen, the PRPs would be responsible for its cleanup.

7. Comment: In addition, and as previously noted, the Borough is discussing the provision of public water to all Borough residents to enhance future development and provide a reliable water source and enhanced fire safety. However, the Proposed Plan presents a potential stumbling block towards that goal. As discussed above, water quantity issues are critical. However, water quality issues also affect the perception of the Borough's public water supply. From some quarters there has been voiced a growing opinion that water obtained from private domestic wells is somehow superior to the Borough public supply, especially where the supply could contain some measure of treated water. The proposed remedy could place the Borough in a position of having to either risk an inadequate water supply by discharging the treated water from the proposed system to surface streams or adding to the perception of a 'tainted' supply by blending the treated water into its current supply. Obviously, the Borough and the community would prefer to lower the volume of treated water while ensuring an adequate contaminant-free supply for public distribution.

Response: EPA's goal is also to ensure a contaminant free supply of drinking water. If the no further action alternative was chosen, EPA believes that the contamination would migrate to the Dublin Borough drinking water supply wells. The in-situ treatment, which is the primary treatment, should effectively reduce the volume and toxicity of the contamination without pumping water from the aquifer. The selected remedy seems to be the best balance of the Borough's goals and concerns. Groundwater extraction and treatment will only be used as a contingency remedial action in the source area, if remediation goals are not met.

<u>D. Comments from Sequa Corporation a PRP</u>

1. Comment: The EPA's proposed remedy depletes the Borough's water supply unnecessarily.

Response: Please see response to Part 2, B, #1 above.

2. Comment: Pump and Treat is an ineffective technology for the Dublin Site.

Response: Please see response to Part 2, C, #2 above.

3. Comment: Significant new information suggests in-situ technology in lieu of any pump and treat remedy.

Response: EPA agrees that in-situ technology seems appropriate at this Site based on the early findings of the Field Pilot Study. The selected remedy has been modified to reflect the importance of the in-situ treatment portion of the remedy.

4. Comment: Significant new information and data after 2 years of Borough operation of OU1 support the finding of no future risk to human health or the environment, consistent with the BLRA. Based on the findings of the approved RI and the BLRA, there are no risks to human health or the environment under current conditions. More recent groundwater data collected after 1999 (post RI and BLRA) confirms the findings of the RI and BLRA. More importantly, however, the new data and information, which was not available for the EPA to consider, allows for the evaluation of the groundwater characteristics after successful implementation of OU1. As representative of the foreseeable future, the pumping of OU1 does not alter the findings of the RI or BLRA. In fact, all groundwater monitoring data (especially the data from July 2001) indicate the plume is not migrating. In accordance with the provisions of the NCP, these circumstances would support a final remedy that relies upon groundwater restoration via natural attenuative processes along with continued monitoring.

Response: Please see response to Part 2, C, #3. For the most impacted groundwater, the carcinogenic risk is 2.8E-03 and the non-carcinogenic Hazard Quotient is 1.12E+02, both of which exceed EPA risk levels.

5. **Comment:** Sequa's suggested alternative. Notwithstanding the current protection to human health and the environment, Sequa is in favor of actively treating the source of contamination with in-situ technologies Sequa believes this is the only technology currently available that could significantly accelerate the groundwater cleanup timeframe in comparison to the restoration that will ultimately occur via natural attentuative processes. Consistent with the findings of the approved FS, if in-situ technologies can be proven to be effective under the site-specific conditions of the Dublin Site, Sequa believes in-situ treatment of the source area, in conjunction with continued monitoring is a preferred final remedy for the Dublin Site.

Response: EPA agrees that in-situ treatment should be the primary means of treatment, but not the only remedial action. Please see response to Part 2, C, #4.

6. **Comment:** Remedial Action Objectives (RAOs) stated in the Proposed Plan are not consistent with the RAOs stated in the approved FS for the Site. The RAO's identified by EPA in its Proposed Plan are "exceptions" in the NCP, as well as in the approved FS, that EPA shall consider in developing remedial alternatives for contaminated Sites.

Response: The FS was accepted by EPA, as per Section VIII. L of the Administrative Order for RI/FS dated August 1991. EPA noted that the document may still contain editorial comments, which are not endorsed or accepted by the Agency. The RAOs in the ROD are stated as:

- Restore the aquifer to drinking water standards;
- Remediate and/or contain the source area contamination; and
- Prevent or minimize further migration of the contaminant plume

These RAO's are not considered "exceptions" to the NCP.

7. Comment: Under the site-specific conditions similar to the Dublin Site (i.e., DNAPL in fractured bedrock), EPA has acknowledged the impracticability of restoring groundwater to drinking water standards within a reasonable timeframe, i.e., achieving Maximum Contaminant Levels (MCLs) as applicable, or relevant and appropriate requirements (ARARs), via the granting of ARAR waivers. To date, EPA has granted waivers for achieving MCLs for groundwater at 31 Superfund Sites, 10 within Region III. Upon review of those decisions, if the in-situ technologies proposed herein fail to achieve MCLs within a reasonable timeframe, the conditions of the Dublin site warrant the granting of a waiver from achieving MCLs based on technical impracticability (TI)(e.g., Rodale Manufacturing, Lehigh, PA). EPA granted a waiver for achieving ARARs at many of these Sites, where DNAPL was present in complex geological systems (i.e., fractured bedrock).

Response: EPA does not believe that a TI waiver is warranted at this time for this Site. The preliminary results of the Field Pilot Study of in-situ treatment have been favorable. EPA's selected remedy focuses on in-situ treatment with a contingency for pump and treat of the source area, if remediation goals are not attained. The remedy also requires a further study to characterize the dissolved plume prior to pump and treat, if required.

8. Comment: The contaminant plume is not migrating and is likely decreasing in size. Contrary to the information presented in the Proposed Plan (and also by EPA during the June 27, 2001 public meeting), there is no evidence that the contaminant plume is migrating.

Response: Please see response to Part 2, C, #3. In a letter written June 3, 1999, EPA clarifies its acceptance of the RI stating that the discussion on the steady state conditions was accepted by EPA because it was presented as "ERM's opinion", which EPA is free to disagree with. EPA issued the Proposed Plan in June 2001 and, therefore, did not consider the sampling results from July 2001in the Plan. Consistent with EPA's position during the RI, the selected remedy includes further study of the dissolved plume for accurate characterization.

9. Comment: No unacceptable risks to human health or the environment are expected under current or future conditions. The BLRA for the Dublin Site, which was approved by EPA in June 1999, found that the only unacceptable risks at the Site are related to the potential exposure to groundwater. However, the BLRA also found that the groundwater exposure pathway is incomplete (i.e., not viable) under current conditions as a result of the successful implementation of the remedy for OU1, and that the combination of the municipal water supply and institutional controls are expected to prevent future exposures to impacted groundwater at the Site. Additionally, the results from the July 2001 sampling event provide empirical support for the conclusion that neither the Borough's municipal water supply nor the water supply of adjacent communities should be adversely impacted in the future.

Response: The aquifer at the Dublin TCE Site is classified as a Class IIA, drinking water aquifer, therefore, the future risk of exposure via ingestion, is viable. It is EPA policy to attempt to remediate drinking water aquifers to beneficial use.

10. Comment: The hydraulic performance of Alternative 8A is uncertain. Sequa has significant concerns related to the hydraulic performance of EPA's proposed alternative (Alternative 8A). During the RI/FS process, Sequa expended considerable effort and resources evaluating and analyzing various alternatives, including the performance of groundwater modeling of each candidate remedial alternative, all under the direction, oversight, and approval of EPA. The analyses included groundwater flow and contaminant fate and transport projections for the nine remedial alternatives evaluated in the FS. Despite the abundance of analyses, EPA in its Proposed Plan selected an alternative with remedial components for which no cumulative evaluation or groundwater modeling has been performed. In the absence of such analyses, several questions remain unanswered: 1) the impacts of the proposed remedy on groundwater supplies throughout Dublin Borough and surrounding communities, 2) the ability of the proposed remedy to achieve the remedial objectives, and 3) the potential for the proposed remedy to exacerbate current plume extent and dynamics. Relying on the other alternatives evaluates in the FS, the proposed alternative has the potential to spread the downgradient plume and compromise the effectiveness of any in-situ or other source control measures.

Response: The selected remedy is a combination of alternatives 6 and 8, both of which were modeled in the FS. The discussion of the modeling effort in the FS identifies the drawbacks of choosing a remedial action based on modeling for a Site as complex as the Dublin TCE Site. As stated in the FS, "EPA has agreed that the solute transport model is not a true representation of natural conditions. Accordingly, the model is primarily being used to assist in the comparison of alternatives." EPA used the hydrogeologic data gained from the modeling to develop an alternative which combined the assets of two different alternatives.

11. Comment: The statement in the "Introduction" says the RI was "modified" and accepted by EPA on December 4, 1998. In accordance with the Administrative Order on Consent for the RI/FS (RI/FS Consent Order), a draft RI was submitted in June 1996, disapproved by EPA in November 1996, and a revised RI was submitted by Sequa in January 1998 (updated from June 1996) and accepted by EPA in November 1998. Any modification of the RI by EPA is not supported by the Administrative Record and would contradict the RI/FS Consent Order.

Response: On December 4, 1998 EPA sent a letter to Brent Murray, Sequa Corporation, stating that the RI was being modified, and accepted as modified, pursuant to Section VIII.L. of the Consent Order. On June 3, 1999 EPA sent a follow-up letter to clarify EPA's acceptance of the RI. Both letters are included in the Administrative Record for the Site.

12. Comment: Any final remedy with potentially competing technologies should be evaluated for cumulative compatibility. Similarly, any selected remedy should allow for elimination of subsequent remedial phases based on the results of earlier remedial actions.

Response: The EPA selected remedy, outlined in this ROD, incorporates this comment.

13. Comment: EPA presents no conceptual design for the locations of the recovery wells, treatment systems, and piping and manifold systems. EPA fails to adequately consider the impact to properties and the measures to be taken to eliminate or reduce the risks associated with a release of contaminated groundwater from the collection, water distribution, and treatment system. Who will be responsible for operation and maintenance and liable in the event of a release.

Response: Please see response to Part 2, C, #6.

14. Comment: Oversights/deficiencies in the estimated cost for Alternative 8A. The cost estimate for Alternative 8A presented in the Proposed Plan contains a number of oversights/deficiencies that result in an underestimation of the actual capital costs and O&M costs for implementing this alternative.

- Two strippers are included for 8 extraction wells which indicates that two separate treatment systems are planned; however, the estimate only includes property access for the wells. Alternative 8A fails to evaluate the feasibility, implementability, or cost for the treatment systems or the collection/conveyance piping and manifold systems;

- The estimate for 8A does not include liquid phase carbon treatment that would likely be necessary for direct discharge;

- The estimate only includes the cost of one dosing event for the in-situ treatment;

- The estimates only includes sampling for one outfall despite having two treatment systems

Response: The information in the cost estimate is based on the best available information regarding the anticipated scope of the selected remedy. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedy. The cost of the selected remedy was calculated using an estimated number of wells (8 wells distributed between the Source Area and downgradient). The cost estimate is based on implementing the contingency action of pumping and treating the source area. If the in-situ treatment attains remediation goals, the contingency action will not be required. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

The capital costs did neglect the cost of the collection/conveyance piping and manifold system which would have been $11,500. The O&M costs did only include testing at one outfall. If both these omissions were included into the cost estimate, the 30-year net present value would have increased approximately 11%.

The estimate did not include liquid phase carbon treatment because the estimate was modeled after alternative 8, which does not include liquid phase carbon treatment. There was only one dosing of potassium permanganate because this was modeled after alternative 6, which only estimated one dosing of potassium permanganate.

APPENDIX B

ENVIRONMENTAL PROTECTION EASEMENT AND DECLARATION OF RESTRICTIVE COVENANTS

1. This Environmental Protection Easement and Declaration of Restrictive Covenants is made this ____ day of ______________, 19___, by and between ____, ("Grantor"), having an address of ____, and, ______________ ____________________("Grantee"), having an address of __________________ _______________________________.

WITNESSETH:

2. WHEREAS, Grantor is the owner of a parcel of land located in the county of _______________, State of _____________, more particularly described on **Exhibit A** attached hereto and made a part hereof (the "Property"); and

3. WHEREAS, the Property is part of the __________________ Superfund Site ("Site"), which the U.S. Environmental Protection Agency ("EPA"), pursuant to Section 105 of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), 42 U.S.C. § 9605, placed on the National Priorities List, set forth at 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register on _________, 19__; and

4. WHEREAS, in a Record of Decision dated _________, 19__ (the "ROD"), the EPA Region __ Regional Administrator selected a "remedial action" for the Site, which provides, in part, for the following actions:

and

5. WHEREAS, with the exception of_______________________________________ ____ ___, the remedial action has been implemented at the Site; and

6. WHEREAS, the parties hereto have agreed 1) to grant a permanent right of access over the Property to the Grantee for purposes of implementing, facilitating and monitoring the remedial action; and 2) to impose on the Property use restrictions as covenants that will run with the land for the purpose of protecting human health and the environment; and

7. WHEREAS, Grantor wishes to cooperate fully with the Grantee in the implementation of all response actions at the Site;

NOW, THEREFORE:

8. Grant: Grantor, on behalf of itself, its successors and assigns, in consideration of [the terms of the Consent Decree in the case of ____ v. ____, etc.], does hereby covenant and declare that the Property shall be subject to the restrictions on use set forth below, and does give, grant and convey to the Grantee, and its assigns, with general warranties of title, 1) the perpetual right to enforce said use restrictions, and 2) an environmental protection easement of the nature and character, and for the purposes hereinafter set forth, with respect to the Property.

9. Purpose: It is the purpose of this instrument to convey to the Grantee real property rights, which will run with the land, to facilitate the remediation of past environmental contamination and to protect human health and the environment by reducing the risk of exposure to contaminants.

10. Restrictions on use: The following covenants, conditions, and restrictions apply to the use of the Property, run with the land and are binding on the Grantor:

11. Modification of restrictions: The above restrictions may be modified, or terminated in whole or in part, in writing, by the Grantee. If requested by the Grantor, such writing will be executed by Grantee in recordable form.

12. Environmental Protection Easement: Grantor hereby grants to the Grantee an irrevocable, permanent and continuing right of access at all reasonable times to the Property for purposes of:

a) Implementing the response actions in the ROD, including but not limited to______ ____;

b) Verifying any data or information submitted to EPA.

c) Verifying that no action is being taken on the Property in violation of the terms of this instrument or of any federal or state environmental laws or regulations;

d) Monitoring response actions on the Site and conducting investigations relating to contamination on or near the Site, including, without limitation, sampling of air, water, sediments, soils, and specifically, without limitation, obtaining split or duplicate samples;

e) Conducting periodic reviews of the remedial action, including but not limited to, reviews required by applicable statutes and/or regulations; and

f) Implementing additional or new response actions if the Grantee, in its sole discretion, determines i) that such actions are necessary to protect the environment because either the original remedial action has proven to be ineffective or because new technology has been developed which will accomplish the purposes of the remedial action in a significantly more efficient or cost effective manner; and, ii) that the additional or new response actions will not impose any significantly greater burden on the Property or unduly interfere with the then existing uses of the Property.

13. Reserved rights of Grantor: Grantor hereby reserves unto itself, its successors, and assigns, all rights and privileges in and to the use of the Property which are not incompatible with the restrictions, rights and easements granted herein.

14. Nothing in this document shall limit or otherwise affect EPA's rights of entry and access or EPA's authority to take response actions under CERCLA, the NCP, or other federal law.

15. No Public Access and Use: No right of access or use by the general public to any portion of the Property is conveyed by this instrument.

16. Notice requirement: Grantor agrees to include in any instrument conveying any interest in any portion of the Property, including but not limited to deeds, leases and mortgages, a notice which is in substantially the following form:

> **NOTICE: THE INTEREST CONVEYED HEREBY IS SUBJECT TO AN ENVIRONMENTAL PROTECTION EASEMENT AND DECLARATION OF RESTRICTIVE COVENANTS, DATED ________, 19__, RECORDED IN THE PUBLIC LAND RECORDS ON ___________, 19___, IN BOOK ______, PAGE _____, IN FAVOR OF, AND ENFORCEABLE BY, THE UNITED STATES OF AMERICA.**

Within thirty (30) days of the date any such instrument of conveyance is executed, Grantor must provide Grantee with a certified true copy of said instrument and, if it has been recorded in the public land records, its recording reference.

17. Administrative jurisdiction: The federal agency having administrative jurisdiction over the interests acquired by the United States by this instrument is the EPA.

18. Enforcement: The Grantee shall be entitled to enforce the terms of this instrument by resort to specific performance or legal process. All remedies available hereunder shall be in addition to any and all other remedies at law or in equity, including CERCLA. Enforcement of the terms of this instrument shall be at the discretion of the Grantee, and any forbearance, delay

or omission to exercise its rights under this instrument in the event of a breach of any term of this instrument shall not be deemed to be a waiver by the Grantee of such term or of any subsequent breach of the same or any other term, or of any of the rights of the Grantee under this instrument.

19. Damages: Grantee shall be entitled to recover damages for violations of the terms of this instrument, or for any injury to the remedial action, to the public or to the environment protected by this instrument.

20. Waiver of certain defenses: Grantor hereby waives any defense of laches, estoppel, or prescription.

21. Covenants: Grantor hereby covenants to and with the United States and its assigns, that the Grantor is lawfully seized in fee simple of the Property, that the Grantor has a good and lawful right and power to sell and convey it or any interest therein, that the Property is free and clear of encumbrances, except those noted on **Exhibit D** attached hereto, and that the Grantor will forever warrant and defend the title thereto and the quiet possession thereof.

22. Notices: Any notice, demand, request, consent, approval, or communication that either party desires or is required to give to the other shall be in writing and shall either be served personally or sent by first class mail, postage prepaid, addressed as follows:

To Grantor:	To Grantee:
______________________	______________________
______________________	______________________
______________________	______________________

23. General provisions:

a) Controlling law: The interpretation and performance of this instrument shall be governed by the laws of the United States or, if there are no applicable federal laws, by the law of the state where the Property is located.

b) Liberal construction: Any general rule of construction to the contrary notwithstanding, this instrument shall be liberally construed in favor of the grant to effect the purpose of this instrument and the policy and purpose of CERCLA. If any provision of this instrument is found to be ambiguous, an interpretation consistent with the purpose of this instrument that would render the provision valid shall be favored over any interpretation that would render it invalid.

c) Severability: If any provision of this instrument, or the application of it to any person or circumstance, is found to be invalid, the remainder of the provisions of this instrument, or the application of such provisions to persons or circumstances other than those to which it is found to be invalid, as the case may be, shall not be affected thereby.

d) Entire Agreement: This instrument sets forth the entire agreement of the parties with respect to rights and restrictions created hereby, and supersedes all prior discussions, negotiations, understandings, or agreements relating thereto, all of which are merged herein.

e) No Forfeiture: Nothing contained herein will result in a forfeiture or reversion of Grantor's title in any respect.

f) Joint Obligation: If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

g) Successors: The covenants, terms, conditions, and restrictions of this instrument shall be binding upon, and inure to the benefit of, the parties hereto and their respective personal representatives, heirs, successors, and assigns and shall continue as a servitude running in perpetuity with the Property. The term "Grantor", wherever used herein, and any pronouns used in place thereof, shall include the persons and/or entities named at the beginning of this document, identified as "Grantor" and their personal representatives, heirs, successors, and assigns. The term "Grantee", wherever used herein, and any pronouns used in place thereof, shall include the persons and/or entities named at the beginning of this document, identified as "Grantee" and their personal representatives, heirs, successors, and assigns. The rights of the Grantee and Grantor under this instrument are freely assignable, subject to the notice provisions hereof.

h) Termination of Rights and Obligations: A party's rights and obligations under this instrument terminate upon transfer of the party's interest in the Easement or Property, except that liability for acts or omissions occurring prior to transfer shall survive transfer.

i) Captions: The captions in this instrument have been inserted solely for convenience of reference and are not a part of this instrument and shall have no effect upon construction or interpretation.

j) Counterparts: The parties may execute this instrument in two or more counterparts, which shall, in the aggregate, be signed by both parties; each counterpart shall be deemed an original instrument as against any party who has signed it. In the event of any disparity between the counterparts produced, the recorded counterpart shall be controlling.

TO HAVE AND TO HOLD unto the United States and its assigns forever.

IN WITNESS WHEREOF, Grantor has caused this Agreement to be signed in its name.

Executed this ______ day of ___________, 19__.

____

By: __________________________

Its: __________________________

STATE OF ___________)
) ss
COUNTY OF _________)

On this __ day of _____, 19__, before me, the undersigned, a Notary Public in and for the State of __________, duly commissioned and sworn, personally appeared ___________________, known to be the _______________ of __________________, the corporation that executed the foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that they are authorized to execute said instrument.

Witness my hand and official seal hereto affixed the day and year written above.

____
Notary Public in and for the
State of __________

My Commission Expires: ______.

This easement is accepted this ____ day of __________, 19__.

UNITED STATES OF AMERICA
U.S. ENVIRONMENTAL PROTECTION AGENCY

By: ____________________________

____

Attachments:	Exhibit A	-	legal description of the Property
	Exhibit B	-	identification of proposed uses and construction plans, for the Property
	Exhibit C	-	identification of existing uses of the Property
	Exhibit D	-	list of permitted title encumbrances

Remedial Design Work Plan For OU2 ROD Implementation

Dublin TCE Site, Dublin Borough, Pennsylvania

July 2004

Prepared by:

ERM

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TABLE OF CONTENTS

1.0 *INTRODUCTION*

1.1 *SITE DESCRIPTION AND BACKGROUND*

The Dublin NPL Site ("Site") is defined by the U.S. Environmental Protection Agency (USEPA) as the 120 Mill Street Property located in Dublin Borough, Bucks County, Pennsylvania, as well as all adjacent areas to which site-related contaminants have migrated. Groundwater contamination, principally trichloroethene (TCE), was first detected near the site by the Bucks County Health Department (BCHD) in 1986.

In June 1990, Sequa Corporation (Sequa), one of several potentially responsible parties (PRPs) for the site identified by EPA, entered into a Consent Order with the Pennsylvania Department of Environmental Resources (PADER, subsequently the Pennsylvania Department of Environmental Protection (PADEP)) to investigate ground water contamination within the bedrock aquifer. In August 1990, the Site was placed on the Superfund National Priorities List (NPL) and lead regulatory oversight transitioned from PADEP to USEPA.

In 1991, USEPA performed a *Focused Feasibility Study (FFS) for Alternate Water Supply for the Dublin NPL Site* (USEPA, 1991a). The provision of an alternate water supply to affected and potentially affected residences and businesses as an early response action led to the designation by USEPA of two Operable Units (OUs) for the Dublin Site - OU1 being an alternate water supply, and OU2 being a final site remedy to address all impacted media at the Site, as necessary (i.e., soil, ground water, surface water and sediment). This Remedial Design Work Plan addresses the design activities necessary to ensure the successful implementation of the final remedy for OU2.

In 1991, Sequa entered into an Administrative Order on Consent (Consent Order) with USEPA to conduct an RI/FS for OU2 (USEPA, 1991b). The RI/FS was approved by USEPA in 1998. A Baseline Risk Assessment (BLRA) was subsequently completed by Sequa and approved by USEPA in 1999 (ERM, 1999).

Coincident with the latter stages of the RI/FS, in August 1995, USEPA issued an *Administrative Order for Remedial Action* to the PRPs to implement the OU1 ground water recovery, treatment and water supply system, as well as related components of the OU1 remedy. Construction of the OU1 treatment system and related components by Sequa occurred over the 1996/1997 timeframe and the system became fully operational in the summer of 1998.

The Feasibility Study (FS) for the site was performed over the 1999/2000 timeframe and was approved by USEPA in March 2001 (ERM, 2000). The FS established the framework of potential remedial alternatives from which USEPA selected the final remedy for OU2. It is also important to note that voluntary testing (i.e., laboratory treatability studies and in-field pilot testing) of in situ chemical oxidation (ISCO) by Sequa over the 2001/2002 timeframe (discussed in Section 2.2 of this Work Plan) also factored into USEPA's Record of Decision (ROD) for the OU2 remedy.

For additional details regarding the site and its history, refer to the final RI and FS reports (Geraghty & Miller/ERM, 1998, and ERM, 2000, respectively).

1.2 *OU2 ROD OVERVIEW*

The ROD for OU2 was issued by USEPA in September 2002. The objectives of the OU2 remedy are to: 1) restore the aquifer to drinking water standards, 2) remediate and/or contain source area contamination, and 3) prevent and minimize further migration of the dissolved phase plume (see ROD, Part II, Section H). To achieve these objectives, the selected remedy is comprised of multiple components. These components, including their interrelationship, are discussed below.

- *Institutional controls* will be implemented to limit future use of the 120 Mill Street property to commercial/industrial land use. A deed restriction will be placed on the property, which will establish a restriction on groundwater usage;

- *A pre-design investigation* to optimize all components of the remedy will be conducted. In addition to the treatability and pilot testing of ISCO that have already been completed, additional pre-design studies will be required to proceed with full scale implementation of ISCO at the site. These studies will be designed to: 1) determine the current nature and extent of source area contamination in both the lateral and vertical directions (following the remediation that occurred during the Pilot Study), 2) aid in the selection of the conceptual design for oxidant delivery, and 3) evaluate the current status of the dissolved phase plume;

- *In situ chemical oxidation (ISCO)* will be employed as a means to significantly reduce the source-strength contamination that remains in groundwater beneath the site. This component of the remedy will involve the injection of permanganate as the oxidant throughout the source area (see Figure 1). The oxidant will be injected under an active pumping/recirculation system, or under a semi-passive system that relies upon natural hydraulic gradients to distribute the oxidant, with the final system design developed during the Conceptual and Detailed Design stages (see Section 2.3);

- *Pump and treat several source area wells at a total of 20 gallons per minute (gpm).* This is a contingent component of the remedy that would be considered to attain hydraulic control (i.e., containment) of source strength contamination, if the implementation of ISCO cannot be shown to meet the remedial action objectives discussed in Section 2.1 and 2.5. The Performance Monitoring Program for ISCO (Section 2.5) will be designed to determine the possible need for this component of the remedy;

- *Pump and treat down gradient wells at 5 gpm each* This is a contingent component of the remedy that may be implemented to minimize or eliminate migration of the dissolved phase plume and to restore the aquifer to drinking water standards. The groundwater pump and treat for the dissolved phase plume will be implemented, if EPA determines it is required, after analyses of the pre-design investigation data and ISCO Performance Monitoring Program data;

- *Increased pumping of the OU-1 supply well.* This is a contingent component of the remedy that may be needed to mitigate further migration of the dissolved phase plume. Pre-design investigations and the ISCO Performance Monitoring Program will determine the need for this component. If these studies determine that the OU1 Supply Well cannot sustain an increase in pumping due to drought or other conditions this component would not be implemented. Additionally, it is important to note that groundwater modeling performed during the FS showed that increased pumping of the OU1 Supply Well has the potential to expand the source area. This condition will be further evaluated during the pre-design investigations; and

- A *Long-Term Monitoring Plan* will be designed and implemented to ensure protection of human health and to evaluate performance of the final site remedy.

A phased approach will be used to implement the OU2 remedy.
The initial steps of remedy implementation will be to complete pre-design studies and the ISCO remedial design, and to subsequently implement the ISCO portion of the remedy. Investigation of the dissolved phase plume

will occur during the design, implementation, and operation of the ISCO remedy. Any reference to the term "contingent" with respect to the remedy discussed in this section is synonymous with the use of the term "contingent" as it appears in the OU2 ROD.

1.3 WORK PLAN OBJECTIVES AND ORGANIZATION

The general and overarching purpose of this Remedial Design Work Plan is to develop and establish the procedures for implementing and complying with the OU2 ROD, and thereby ensuring the successful implementation of the OU2 remedy. The specific objectives are to:

1. establish the relationship between the various ROD elements identified in 1.2 above;

2. establish performance metrics for evaluating the various ROD elements; and

3. clarify the purpose and scope of each of the required ROD deliverables.

As discussed in Section 1.2 above, perhaps the most critical component of the selected final remedy for OU2 is ISCO within the source area. If the implementation of ISCO is successful in achieving the remedial action objectives, other components of the remedy become unnecessary and would not be implemented. Due to the nature of ISCO technology (see Section 2.1.2), typical construction activities are limited. Therefore, a multi-step design process (i.e., preliminary, 30%, 60%, 90%, and 100%) is considered not beneficial or economic. Consequently, to streamline and accelerate the remedial design process, design activities will be broken down into three steps as follows: 1) Pre-design Investigations; 2) Conceptual Design; and 3) Detailed Design.

The remainder of this Work Plan presents the approach and plans for conducting remedial design activities for implementing each of the OU2 *remedy components, including a discussion of reporting requirements,* deliverables, and a comprehensive remedial design schedule.

In addition to this Work Plan, other documents (i.e., Health & Safety Plan (HASP), Site Management Plan, and Sampling and Analysis Plan) will be prepared and submitted in accordance with the schedule presented in Section 8.

2.0 IN-SITU CHEMICAL OXIDATION OF SOURCE AREA

2.1 DESCRIPTION AND OBJECTIVES

This section provides a definition of the "source area" to be treated by ISCO (Section 2.1.1), a brief description of the proposed *in-situ* chemical oxidation (ISCO) technology (Section 2.1.2) , and the objectives of the ISCO remedy (Section 2.1.3).

2.1.1 Source Area Definition

For remedial design/remedial action (RD/RA) activities related to OU2 of the Dublin TCE Site, the definition of "source area" is that area containing trichloroethylene (TCE) in groundwater at concentrations greater than or equal to 10 mg/L based on pre-Pilot Test data (see Figure 1). The TCE in groundwater at these levels is inferred to be the result of dissolution of dense non-aqueous phase liquid (DNAPL) occurring in the fractured bedrock below the water table. This is based on USEPA guidance that DNAPL is likely present if groundwater concentrations exceed 1% of a compound's pure phase effective solubility (USEPA, 1992). The effective solubility for TCE is 1,100 mg/L (Pankow and Cherry, 1996).

It is recognized that remediation of source material occurred during the Pilot Test (ref. activities documented in *Pilot Testing of In Situ Chemical Oxidation for Chlorinated Solvents in Groundwater, Dublin NPL Site, Pennsylvania* (GeoSyntec Consultants, February 2003)), and the 'source area' now is likely to be smaller than prior to the Pilot Test. This pre-Pilot Test starting point will also be considered during development of the ISCO Performance Monitoring Program (PMP), as described in Section 2.5 of this Work Plan.

2.1.2 ISCO Technology Description

ISCO will be used to treat the source area at the Site. An oxidant solution containing potassium permanganate ($KMnO_4$) will be injected into the subsurface and allowed to migrate under natural and/or forced hydraulic gradients through the TCE source area in fractured bedrock beneath the Site. As it migrates through the source area, the reaction between permanganate and TCE will involve an attack on the carbon-carbon double bonds, ultimately mineralizing TCE to harmless inorganic products such as carbon dioxide (CO_2), water and chloride. At typical permanganate application concentrations, the destruction half-lives of target contaminants such as TCE are generally on the order of a few minutes (Yan and Schwartz, 1999).

In recent years, the results of ISCO research and field applications are showing that the ISCO technology has the ability to accelerate DNAPL dissolution by order(s) of magnitude, with the promise of reducing the time for source remediation by a comparable factor. Evidence also exists for the potential of ISCO to treat contaminants in low permeability materials, such as rock matrices. These data suggest that ISCO has the potential to control slow matrix counter-diffusion and rebound following initial treatment. The results of these and other studies demonstrate that DNAPLs can be aggressively remediated through oxidation using permanganate in both porous and fractured media, and that permanganate can diffuse into the fracture matrix promoting destruction of chlorinated solvents that may otherwise diffuse out of the matrix following initial treatment. In this manner, permanganate has the potential to prevent or limit the effects of chemical rebound resulting from matrix counter-diffusion.

2.1.3 *ISCO Remedy Objectives*

The ISCO Remedy objective is to return the source area to drinking water standards within 3 years from the date of the ROD. A three-year performance review will be conducted by the EPA to determine the efficacy of the ISCO technology to meet the remedy objective. Sequa will present data to EPA for review, including, but not limited to, sampling data in the source area, temporal trends for TCE concentrations within the source area, temporal trends of TCE concentrations in the downgradient dissolved-phase plume, and temporal trends relative to dissolved TCE mass flux from the source area.

The ROD requires that the efficacy of ISCO in the source area will be assessed with respect to remediation goals by September 2005, (i.e. within 3 years of the ROD). Pursuant to an "Explanation of Significant Difference" and for practical purposes, this 3-year period will initiate at the commencement of ISCO startup, to ensure an adequate duration for demonstration and evaluation of the ISCO technology performance. This 3-year period is referred to herein as the "3-Year Review Period".

If the remedial objectives for ISCO are not met, the ISCO system will be evaluated and modified, if feasible/appropriate, rather than immediately triggering the contingent source area pump and treat remedy. The USEPA may extend the 3-year review period to allow such evaluation and implementation of modifications.

2.2 *TREATABILITY STUDY AND PILOT TEST REVIEW*

2.2.1 *Treatability Study*

Paragraph 11 of the Consent Decree requires submittal of a Treatability Study Work Plan and Evaluation Report. Treatability testing has already been conducted voluntarily by Sequa over the 2000/2001 timeframe, and the referenced deliverables have already been provided to USEPA (Treatability Report GeoSyntec, 2001a and 2001b). The ISCO treatability study was conducted with Site groundwater and bedrock materials to: i) estimate the permanganate oxidant demand of groundwater and bedrock materials; ii) assess the potential impacts of oxidation on the inorganic chemistry of the groundwater; iii) assess the potential for the oxidant to destroy chlorinated solvents within the bedrock matrices; and iv) identify performance factors that may influence design and scale-up of a potential ISCO application, including VOC destruction rates, oxidant losses, and potential geochemical interferences. The methodologies and results of the treatability study are presented in the Treatability Report (GeoSyntec, September 2001b).

The results of the treatability study confirmed that ISCO (with permanganate as the oxidant) can rapidly destroy high concentrations of TCE in the Site groundwater, with reaction rates from minutes to days. The groundwater matrix did not exert a significant oxidant demand. Similarly, the oxidant demands of shale and siltstone bedrock samples from the Site were low in comparison to typical oxidant demands exerted by porous media. Accordingly, these treatability study results indicate that neither TCE-impacted Site groundwater nor fractured bedrock materials are likely to exert a significant oxidant demand during field implementation.

Results also confirmed that permanganate application did not adversely impact groundwater quality. Specifically, the concentrations of dissolved metals did not significantly increase following ISCO application, with the exception of potassium and manganese (which are constituents of the $KMnO_4$ salt), and slight increases in molybdenum, which is known to be an impurity in the commercial-grade permanganate used for the bench tests.

Based on the results of the ISCO laboratory treatability tests, it was determined that ISCO is technically feasible for the Site, provided that groundwater flow in the fractured bedrock can be adequately understood, and oxidant delivery effectively accomplished. On this basis, a pilot test of ISCO was conducted at the Site, as described in Section 2.2.2

2.2.2 *Pilot Test*

A pilot test of ISCO using potassium permanganate was recently completed by GeoSyntec and ERM (GeoSyntec, 2003). The results of the pilot test demonstrated that significant decreases of TCE concentrations in groundwater could be achieved by circulating permanganate solution through the targeted aquifer zone, and that permanganate could be effectively recirculated through the fractured bedrock at the Site. Also demonstrated was the fact that the oxidation of TCE could be achieved without compromising the downgradient groundwater quality, an important consideration when performing remedial activities in a drinking water supply aquifer.

The pilot test employed a phased approach consisting of three main tasks: i) pilot test area (PTA) instrumentation; ii) PTA characterization and conservative tracer testing; and iii) ISCO field testing. The first task was to design the PTA recirculation system and instrument the PTA. The second task involved characterization and tracer testing activities within the PTA to improve the understanding of hydraulics in the PTA, and to refine the design of subsequent pilot- and full-scale ISCO field applications. Following successful PTA characterization, the ISCO field test was conducted to demonstrate the ability of ISCO to aggressively destroy TCE in situ and reduce TCE mass flux from the source zone.

The key results of the characterization task, as they pertain to full-scale application, can be summarized as follows:

- The principal transmissive fracture zones within the fire tower well (FTW) on-site are located at depth intervals of 75 to 140 ft below ground surface (bgs), 280 to 305 ft bgs, and 325 to 330 ft bgs. Flow into the FTW from the bottom 135 feet of the well (from 371 to 506 ft bgs) appears to be negligible, suggesting that the bedrock at this depth is not transmissive;

- The highest contribution of TCE mass to the FTW appears to come from fracture zones located at depths less than 140 ft bgs. This finding is in contrast to the conclusions drawn from the results of discrete zone sampling conducted during the Remedial Investigation ("RI"; Geraghty & Miller, 1998), which suggested that TCE is evenly distributed throughout the vertical section of the FTW. However, these data are consistent with the finding that the source of TCE detected at the bottom of the FTW is likely the result of the prior migration of TCE (i.e., either DNAPL or TCE-impacted groundwater) from shallower zones downward through the FTW to deeper intervals in the bedrock, as was suggested in the RI;

- Wells IW-1 and BCM-2 are hydraulically connected to the FTW (based on fluorescent dye tracer testing), through fractured bedrock at depths of less than about 100 ft bgs. Well MW-6, located approximately 300 feet upgradient of the FTW, did not appear to be connected to the FTW under the flow conditions tested; and

- Bromide was not detected at monitoring wells MW-2, MW-4 and MW-8 located downgradient of the PTA, suggesting that limitations with recovery efficiency in the PTA were not significant enough to adversely impact downgradient groundwater chemistry.

The key results of the ISCO field test, as they pertain to full-scale application, can be summarized as follows:

- No significant changes in the water level within the injection well were observed during permanganate addition, suggesting that the system used for removing particulates from the injected permanganate solution was effective in minimizing well fouling due to the formation of manganese dioxide (MnO2) precipitate;

- Recirculation of permanganate through the PTA resulted in significant decreases in TCE concentrations throughout the FTW, with concurrent increases in the chloride concentration, confirming that TCE was degraded;

- The permanganate demand exerted by the bedrock matrix and TCE-impacted groundwater was insufficient to prevent breakthrough of permanganate through the upper fracture zone into the FTW, or to adversely affect performance; and

- Permanganate was effectively recirculated throughout the upper transmissive zone in the fractured bedrock and contained by groundwater extraction from the FTW. In addition, permanganate was not detected at monitoring wells MW-2, MW-4 and MW-8 located downgradient of the PTA, suggesting that impacts to downgradient groundwater quality as a result of source area ISCO are unlikely.

2.3 *SYSTEM DESIGN*

Due to the non-design intensive nature of the ISCO technology (i.e., minimal construction activities), and to streamline and accelerate the overall design process, design activities for ISCO implementation will be broken down into the following three steps: 1) Pre-design Investigations; 2) Conceptual Design; and 3) Detailed Design. Each of these steps is discussed below.

2.3.1 *Pre-Design Investigations*

A Pre-Design Work Plan will be prepared and submitted for data collection activities to be conducted prior to preparing the Conceptual Design. These data collection activities will include sampling and analysis to better characterize the source area. Field investigations will be conducted in accordance with this Work Plan. The Work Plan will include a Site Management Plan, Sampling and Analysis Plan (including a Field Sampling Plan and Quality Assurance Project Plan that meets the requirements of Section VIII of the Consent Decree), and a Health and Safety Plan (that meets the requirements of Section 11 a. of the Consent Decree).

Following completion of the field activities, a report summarizing the results of the pre-design investigations will be prepared and submitted to USEPA in accordance with the schedule presented in Section 8.

2.3.2 *Conceptual Design*

A Conceptual Design for ISCO implementation will be prepared and issued to USEPA. The Conceptual Design will include the Performance Monitoring Program for the ISCO remedy implementation along with the following:

- Design Criteria, including a project description, design requirements and provisions, preliminary process flow diagrams, operation and maintenance requirements;
- Basis of Design, including justification of design assumptions, a project delivery strategy, remedial action plans for off-site permits, and preliminary easement and access requirements;
- Preliminary Drawings and Specifications, including an outline of the general specifications, preliminary schematics and drawings, chemical and geotechnical data (including data from pre-design activities);

- a value engineering screen and any related study results;
- a preliminary Remedial Action (RA) Schedule;
- a preliminary RA contingency plan;
- a preliminary RA HASP;
- a preliminary RA waste management plan;
- a preliminary RA Sampling and Analysis plan.

Following completion of the ISCO Pilot Test in 2002, Sequa proceeded voluntarily with some conceptual design work for full-scale implementation. At present, two approaches to delivering the oxidant, which may occur multiple times, are under evaluation - 1) an active system that would entail complete hydraulic recirculation within the source area, and 2) a semi-passive approach that would rely more upon natural gradients to distribute the oxidant throughout the source area and perhaps to the dissolved phase plume beyond the source area. During the Conceptual Design phase of the design process, this ongoing evaluation will be completed and a recommended approach will be submitted to USEPA for approval.

2.3.3 *Detailed Design*

Following approval of the Conceptual Design by the Agencies, a Detailed Design will be prepared and issued that will address 100% of the full-scale ISCO system. The Detailed Design will include the following:

- Remedial Action (RA) Schedule;
- RA contingency plan;
- RA HASP for USEPA acceptance;
- RA waste management plan;
- preliminary RA decontamination plan and a schedule for submission of the final RA decontamination plan;
- System Design Criteria;
- RA Sampling and Analysis Plan (directed at measuring progress towards meeting the Performance Standards);

- final design plans, drawings and specifications;
- the basis of design;
- a revised O&M Plan and a schedule for submission of the final O&M Plan;
- a Construction Quality Assurance Plan; and
- a project delivery strategy.

The Detailed Design will also include the final Performance Monitoring Program and will address sampling locations, frequency, and field methods; analytical methods; QA/QC; and data interpretation techniques.

Upon approval, approval with modifications, or modification by USEPA, the Detailed Design submittal will serve as the final RA Work Plan

2.4 *ISCO SYSTEM IMPLEMENTATION*

The ISCO system will be implemented in accordance with the RA Work Plan. Construction and operational information for the ISCO application, as well as associated logistics and schedule, will be included in detail in the Conceptual and Detailed Design deliverables. The process for submitting deliverables and conducting project meetings during implementation of the ISCO component of the RA, are discussed in Section 7 of this Work Plan.

2.4.1 *RA Schedule*

The RA Schedule that is included in the Detailed Design (Section 2.3.3) will specify all the major milestones for completion of the ISCO remedy, including performance monitoring for demonstrating compliance with the performance requirements specified in the ROD.

2.4.2 *Progress Reports*

During implementation of the ISCO remedy, the Settling Defendants will submit Progress Reports to USEPA. During construction, the Progress Reports will be submitted monthly and will summarize all activities that have been conducted each month, those planned for the next month and an estimate of construction completion. After completion of construction and if USEPA approves, the frequency of submission of the Progress

Reports may be reduced. The Progress Reports will also identify any problems encountered and/or any changes to the schedule. The Progress Reports will also include the results of any monitoring conducted during the reporting period.

2.4.3 *Operation and Maintenance Plan*

In accordance with the schedule provided in the Detailed Design (Section 2.3.3), a final operation and maintenance (O&M) Plan will be submitted to ensure the long-term, continued effectiveness of the ISCO remedy. This plan will include, at a minimum, the following:

- a description of normal O&M procedures, including a description of each component in the process, its specific function, method of operation and its relationship to other system components during start up, normal operations and shut down, and will be sufficiently clear to allow operation by a third party unfamiliar with the system;

- a description of potential operational problems, the resulting impact on the system, and an appropriate solution;

- a description of routine process monitoring and analysis for the purpose of evaluating system performance;

- a description of contingent operation and monitoring;

- an operational safety plan;

- a description of equipment;

- record keeping and reporting requirements;

- a maintenance program for monitoring wells including, at a minimum, the following:

    1. a provision for prompt and proper abandonment, as appropriate, of wells used during the RI/FS which are currently unusable or which become unusable during the RA activities;

    2. a provision for inspection, continued maintenance and repair, if necessary, of all wells used during the RI/FS and not abandoned;

3. a provision for inspection, continued maintenance and repair, or abandonment, of wells used during the RI/FS and additional wells used during the RD, RA, and O&M phases. It is noted that prior to any well abandonment, an explanation/justification for well abandonment will be provided to USEPA, and only upon USEPA approval will wells be abandoned. Once approved for abandonment by USEPA, abandonment will be performed in accordance with Commonwealth of Pennsylvania guidelines; and

- a program to ensure continued effectiveness of Institutional Controls, if applicable.

Sampling and analysis activities described in the O&M Plan will be for the purpose of evaluating general system operation and not for the purpose of demonstrating compliance. Sampling and analysis conducted for the purpose of demonstrating compliance will be described in the Performance Monitoring Program (PMP), per Sections 2.2, 2.3 and 2.5 of this Work Plan.

2.4.4 *Project Meetings*

Project meetings with USEPA during implementation of the ISCO remedy will occur no less frequently than monthly, and periodically thereafter during the post-construction evaluation period to discuss the status of the project, present the results of any investigations, and to discuss any issues that arise. At least one week prior to each meeting, USEPA will receive a proposed agenda for the meeting, a summary of the issues that they wish to be discussed and relevant supporting information. The following is a list of mandatory meetings that will be conducted, as a minimum:

1. Construction Meetings - During the construction period, there will be a meeting every two weeks with USEPA regarding the progress and details of construction, unless USEPA decides to meet monthly or less frequently during periods of less intensive construction activities.

2. Final Inspection Meeting - Within seven (7) days after all construction activities required by the Detailed Design are complete, a Final Inspection Meeting will be scheduled and conducted at the Site. This inspection will include participants from all parties involved, including but not limited to prime contractors, USEPA and PADEP.

3. Meetings During Post-Construction Evaluation Period - During the post-construction evaluation period referred to in Section 2.1.3, meetings will occur quarterly with USEPA regarding operation and performance of the ISCO system and regarding any changes proposed and/or implemented, unless USEPA decides to meet less frequently.

Additional meetings may also be scheduled as necessary to discuss any issues that arise during implementation of the ISCO remedy and during the post-construction evaluation period.

2.4.5 *Interim Remedial Action Report*

Following the final inspection meeting, an Interim Remedial Action Report will be developed and submitted to USEPA for review and approval or modification. This report will include the following:

1. a brief description of outstanding construction items from the final inspection meeting and an indication that the items were resolved;

2. a synopsis of the Remedial Action construction work conducted and certification that this work was performed in accordance with the Detailed Design;

3. an explanation of any modifications to work in the Detailed Design and why these were necessary for the project;

4. as built drawings; and

5. certification(s) that the ISCO remedy components that entail construction have been constructed and are operational and functional.

2.5 *PERFORMANCE MONITORING PROGRAM*

The purpose of the Performance Monitoring Program (PMP) is to evaluate both the operation of the remedial system and its efficacy with regard to the remedial action objectives. Accordingly, the PMP will be designed to include a component that addresses O&M parameters, source area treatment, and temporal trends in the downgradient dissolved phase plume. The PMP will be developed conceptually as part of the Conceptual Design submittal, and refined and finalized in the Detailed Design stage.

2.5.1 *Operation and Maintenance*

The O&M component of the PMP will identify the types of monitoring necessary to assess system operation and compliance with applicable permits and applicable, or relevant and appropriate requirements (ARARs). It will include tracking oxidant mass balance (i.e., permanganate amounts to be injected), groundwater and oxidant pumping rates, as applicable, and groundwater chemical profile including chloride, TCE and permanganate concentrations. Groundwater will be analyzed for these parameters at least monthly during oxidant injection.

2.5.2 *Source Area Treatment*

The PMP will also establish the monitoring program for assessing the effectiveness of ISCO in meeting the remedial objective of 5 ug/l of TCE in the source area. The effectiveness of the source area treatment will be evaluated using data, as discussed in Section 2.1.3, to determine if the TCE concentrations in the source area, relative to the remedial goal of 5 ug/l, have been met. In addition to TCE concentrations, data will be presented regarding the dissolved TCE mass flux emanating from the source area, and temporal trends in TCE concentrations and mass flux. The baseline for determining reduction in mass flux and temporal trends in concentrations and/or mass flux will be based on the Pre-Pilot test data.

Compliance will be demonstrated by sampling groundwater proximal to the downgradient perimeter of the defined source area (see Figure 1) during and after terminating operation of the ISCO system. Should monitoring indicate that TCE concentrations in the source area have not reached the clean-up level of 5 μg/L of TCE, or demonstrated a trend to achieve such in the future, then EPA shall decide, after the 3-Year Review Period one of the following: (i) modification and further operation of the ISCO system; or (ii) implementation of the contingent pump and treat hydraulic containment component of the remedy.

2.5.3 *Impact on Dissolved Phase Plume*

Finally, the PMP will establish the monitoring program for assessing the impact of source remediation on the downgradient dissolved phase plume. It will include temporal trend analyses for attaining Maximum Contaminant Levels (MCLs) for the volatile organic compounds (VOCs) of concern. The PMP will supplement the investigation of the dissolved plume initiated as part of the Pre-remedial Design Investigation.

3.0 SOURCE AREA PUMP AND TREAT (CONTINGENT)

3.1 DESCRIPTION AND OBJECTIVES

This contingent source-area remedy will be implemented if the ISCO effort is determined to be unsuccessful in accordance with the criteria and procedures presented in Section 2.5.

The primary objective would be to contain the migration of the source area plume, and thus restrict the flux of contaminants leaving the subject property via groundwater transport. Although groundwater quality would be expected to improve over time, this technology may not in and of itself, achieve remedial objectives for groundwater quality.

The pump and treat containment system would only be applied on the subject property. Groundwater will be extracted from one or more recovery wells installed downgradient of the source area. Treatment of the extracted groundwater will be performed using conventional air stripping. The treated water would likely be discharged to the municipal sanitary sewer.

The number of potential extraction wells would be determined in a pre-design investigation to establish applicable pumping rates, well spacing, and water treatment volumes.

3.2 TRIGGERING CONDITIONS

The decision to implement source area pump and treat, as described above, would be based on evaluation of the following conditions:

- temporal trends for mass flux from the source area are not sufficiently favorable (taking into consideration any rebound effects);
- data indicate that TCE concentrations in the source area have not been reduced to the cleanup level of 5 μg/L and continuing the ISCO treatment will not cause the source area to reach the cleanup level.

EPA will evaluate the ISCO system throughout the three-year performance period to determine whether the system should be modified or whether the contingent pump and treat remedy should be implemented. The evaluation will include an assessment of how the contingent source remedy will affect the downgradient plume.

3.3 *SYSTEM DESIGN*

Because this component of the remedy is contingent upon the results of ISCO implementation, design efforts (especially the latter stages of conceptual design and detailed design) will be deferred until the need for the remedial component is determined.

3.3.1 *Conceptual Design*

The conceptual design for a pump and treat system for source area containment will be determined based on a pre-design investigation focused on hydraulic containment of the source area.

A preliminary system design might include a series of extraction wells along the hydraulically downgradient (i.e., northwest) side of the 120 Mill Street property, and would likely include an air stripper. The preliminary conceptual design would likely call for discharge of the treated groundwater to the municipal sanitary sewer, through an existing access port on the subject property.

3.3.2 *Detailed Design*

Should the source area pump and treat contingent remedy be pursued, a detailed design would be prepared subsequent to agency review of the Conceptual Design.

3.4 *SYSTEM IMPLEMENTATION*

System implementation criteria will be determined subsequent to the detailed design. The necessary extraction wells may be either existing wells, newly installed wells, or a combination of both.

3.5 *PERFORMANCE MONITORING*

The principal performance monitoring criteria for a pump and treat system will be whether hydraulic control has been achieved to mitigate VOC flux from the onsite source area to offsite groundwater. Measurements of potentiometric surface data may also be used to monitor hydraulic control. Monitoring data format and exchange (including electronic data deliverables, or EDD) are discussed in the Sampling and Analysis Plan portion of the Project Control Plans which are appended to this Work Plan.

4.0 *REMEDIATION OF DISSOLVED PHASE PLUME (CONTINGENT)*

4.1 *DESCRIPTION AND OBJECTIVES*

The need for remediation of the dissolved phase plume will be determined subsequent to the evaluation of ISCO performance and the success of mass flux reduction to the offsite dissolved phase plume. In addition, monitoring of the dissolved phase plume will assess the degree to which natural attenuation and groundwater flow have affected the dissolved phase plume configuration and concentrations over time, including the influence of the OU-1 pumping well.

Should remediation of the dissolved phase plume be necessary based on this evaluation, pump and treat is specified in the ROD. Other options for remediation may be presented to EPA. EPA will consider such options, and will have sole authority as to whether such options are implemented.

4.2 *REVIEW OF AVAILABLE DATA*

Concurrent with the implementation of ISCO for source area remediation, groundwater monitoring data will be obtained and compiled to assess the temporal trends in VOC levels in groundwater beyond the source area.

Sequa may perform post-remediation risk calculations based on the level of source area remediation achieved, operation of OU-1, and the latest contaminant levels observed in the downgradient plume. Conclusions drawn from these efforts will be considered in the evaluation of the need for additional remediation of the dissolved phase plume.

4.3 *TRIGGERING CONDITIONS*

The need for active treatment of the dissolved phase plume would be based on USEPA's evaluation of the following conditions:

- ISCO treatment of the source area fails to mitigate mass flux into the dilute plume within the required timeframe (see Performance Monitoring Plan for ISCO, Section 2.5);
- Contingent pump and treat remediation of the source area, if applied, fails to mitigate mass flux into the dilute plume within the required timeframe (see PMP, Section 2.5);

- Temporal trend analyses do not indicate that MCLs will be attained;

- Post-remediation risk calculations indicate the existence of unacceptable risks

5.0 *INCREASED PUMPING OF OU-1 SUPPLY WELL (CONTINGENT)*

5.1 *DESCRIPTION AND OBJECTIVES*

The objective of this remedial action component would be to increase the capture of portions of the dissolved phase plume and thereby mitigate the potential migration of the dissolved phase plume beyond its current lateral extent. However, after implementation of the ISCO portion of the remedy, the viability of this action will need to be assessed based on all data currently available to ensure that it does not conflict with other remedial objectives.

This component of the remedy would only be considered for implementation if data indicate the dissolved phase plume is migrating. The implementability of this component would also need to be assessed to ensure adequate system capacity.

5.2 *REVIEW OF FS MODELING RESULTS*

In considering the implementation of this component, the potential benefits of curtailing the migration of the dissolved phase plume against the potential adverse impact of expanding the source area would need to be evaluated (ref. prior modeling results from the FS.)

5.3 *TRIGGERING CONDITIONS*

Notwithstanding the contingent need for this action, the current concerns regarding possible expansion of the source area (if the rate of extraction from the OU1 Supply Well is increased) along with concerns regarding hydraulic conditions and sustained yield of the well, implementation of this component of the OU2 remedy will require further evaluation and resolution prior to proceeding with implementation. Consideration for implementation of this component of the remedy would be based on the investigation of the affect of other remedial components on the dissolved phase plume. It is anticipated that this component of the remedy would not be implemented if investigations determine that the OU1 Supply Well cannot sustain an increase in pumping rate, or if the detrimental impact of the remedy outweighs the potential benefits.

5.4 *SYSTEM DESIGN*

Because this component of the remedy is contingent upon the results of ISCO implementation, design efforts (especially the latter stages of conceptual design and detailed design) will be deferred until the need for the remedial component is determined.

5.5 *SYSTEM MONITORING*

If applicable, system monitoring procedures will be developed and documented. Performance monitoring would include parameters that address O&M of the OU1 Supply Well (including sustainability of well yield), and the effect the increased pumping has on the source area and the dissolved phase plume, as evidenced by temporal and aerial trends in contaminant concentrations.

6.0 *LONG-TERM MONITORING PROGRAM*

6.1 *OBJECTIVES*

Long-term monitoring will be performed to document ground water quality changes over time. This includes:

- monitoring of locations within the source area, as well as locations within the dissolved phase plume, and

- monitoring in the source area that will be performed subsequent to ISCO treatment (to monitor for any rebound effects).

Monitoring will be performed to assess the need for supplemental ISCO actions, and/or any of the contingent components of the remedy, including active remediation of the dissolved phase plume.

6.2 *SCOPE*

The OU2 monitoring program will be integrated with the existing OU-1 monitoring program into a combined monitoring program, and the scope of the long-term monitoring program for OU2 will be developed during the Conceptual and Detailed Design stages of the RD process.

6.3 *DESIGN/DESCRIPTION*

6.3.1 *Locations*

Monitoring wells to be used for a long-term monitoring program for the OU2 remedy will be determined in the Conceptual Design and Detailed Design. This may involve the installation of one or more additional monitoring wells. Procedures for sample collection are described in the *Sampling and Analysis Plan (specifically, the Field Sampling Plan).*

6.3.2 *Analyses*

Decisions regarding the full suite of analyses that samples will be collected for will be made during the design process, but at a minimum, all groundwater samples from the monitoring wells will be analyzed for VOCs by EPA Method 8260. All analytical procedures will be presented in the Sampling and Analysis Plan, and the Quality Assurance Project Plan (QAPP).

6.3.3 *Frequency*

The frequency of the long-term monitoring program will be described in the Conceptual Design and Detailed Design. A preliminary approach would likely begin with quarterly sampling of selected wells.

6.3.4 *Reviews/Modifications*

The long-term monitoring program will be revisited over time. Subsequent to ISCO treatment, the number of wells, and the frequency of sampling of those wells, may be adjusted for future years.

Any modification to the initial sampling scheme (i.e., per the final remedial design) will be subject to review and approval by USEPA.

7.0 OTHER ROD REQUIREMENTS/CONSIDERATIONS

7.1 FORMAL REVIEWS

7.1.1 *3-Yr. Performance Review for Efficacy of ISCO*

This review will be scheduled to occur 3 years after the commencement of the ISCO system construction to ensure an adequate duration for demonstration and evaluation of the ISCO technology performance.

7.1.2 *NCP-Required 5-Yr. Review of Total Remedy*

The 5-year review of the overall site remedy (OU1 and OU2) is scheduled for February 2005. Consideration will be given for integrating the 3-year performance review for ISCO with the statutory 5-year review for the total remedy due to the similar review timeframes.

7.2 DELIVERABLES

A number of deliverables will be prepared as part of the OU2 remedial design process. Many of these deliverables are discussed in other sections of this RD Work Plan and are also discussed briefly below. Information regarding the scheduling of these deliverables is presented in Section 8.

7.2.1 *Pre- Design Investigation Report(s)*

This deliverable will include information and findings from the ISCO pilot test report (GeoSyntec, February 2003) and the Pre-Design Report described in Section 2.3.1.

7.2.2 *Conceptual and Detailed Design Reports*

For design of the ISCO system, all of the design submittals referenced in the proposed RD/RA Consent Decree will be incorporated into the Conceptual and Detailed Design submittals. As discussed in Section 2.3 of this Work Plan, it is anticipated that the Conceptual Design will encompass, as a minimum, the Preliminary Design and 30% Design stages. The Detailed Design will encompass the finalization of the design process, i.e., from Concept Design through 100% completion. A similar breakout of design information is anticipated for any of the contingent remedy components, as applicable.

7.2.3 *Operation and Maintenance Plan*

Separate operation and maintenance (O&M) plans for ISCO and pump and treat components will be prepared, as applicable.

7.2.4 *Long-Term Monitoring Plan*

As required, a Long-Term Monitoring Plan will be prepared. See discussion in Section 6.0.

7.2.5 *ISCO Performance Report for 3-Yr. Review*

As required, an ISCO performance report to be considered by EPA in the 3-yr. Review, will be prepared. This report will document that implementation of the ISCO system was in accordance with the RA Work Plan (i.e., approved final design submittal), and will summarize all of the results from the Performance Monitoring Plan for ISCO (see Section 2.5). The data to be incorporated into the ISCO performance report will include data that addresses: 1) O&M of the ISCO system, 2) source area treatment, and 3) impact of source area treatment on the dissolved phase plume.

7.2.6 *Institutional Controls*

Institutional controls are an important component of the OU2 remedy and are intended to permanently limit the 120 Mill Street property to commercial/industrial land use and prohibit residential use in the future. The OU2 remedy also requires that groundwater use be prohibited for the 120 Mill Street site. As the means of implementing these institutional controls, 120 Mill Street property will be subject to a deed restriction. A report will be prepared and submitted that documents the successful implementation of these institutional controls, and will include documentation of the recording of the deed restrictions.

7.2.7 *Routine Progress Reports*

As required by the Consent Decree, written monthly progress reports will be prepared and submitted throughout the course of remedial design activities. These reports will include the following information:

- Activities performed during the previous month;
- Summaries of all sampling results or other relevant data received during the previous month;

- Any deliverables required by the Consent Decree submitted during the previous month;
- All significant activities scheduled for the upcoming six-week period;
- Information regarding the percentage of completion of major activities; this information will also include discussions of any significant delays, including causes and actions taken to minimize schedule impacts; and
- Any modifications to project Work Plans (both proposed and approved).

8.0 *IMPLEMENTATION SCHEDULE*

A schedule for implementing the Remedial Design activities required by the OU2 ROD and described in this Work Plan is presented in Table 1.

Table 1 Preliminary Implementation Schedule – OU2 Remedial Design Activities

Task ID		Task Activity	Estimated Start Date(1)	Estimated Duration	Comments
1		HASP, Site Management Plans, and Sampling & Analysis Plan	Completed	Completed	Revisions to these Project Control Plans will be made during the Remedial Design, as necessary
2		Conceptual Design (Including design of Pre-Design Investigations)	In progress	8 weeks(1)	Includes time for Agency review and comment, and revisions.
3		Pre-Design Investigations	Week 12	12 weeks	Includes time for Agency review and comment, and revisions.
4		Detailed Design	Week 22	14 weeks	Work performed concurrent with Task #3. Includes time for Agency review and comment, and revisions
5		ISCO Implementation			
	5a	- Mobilization and Site Set-up	Week 36	4 weeks	To be commenced upon Agency approval of Detailed Design
	5b	- Equipment/Material Procurement	Week 36	4 weeks	Concurrent with Task 5a
	5c	- System O&M Plan	Week 36	4 weeks	Concurrent with Task 5a
	5d	- System Start up	Week 40	3 weeks	
	5e	- System O&M Activities	Week 43	Weekly	Initial system O&M will be weekly; may be reduced over time
6		Performance Monitoring/Long-Term Monitoring Plan	Week 43	Quarterly	Frequency of monitoring may be adjusted
7		3-year ISCO Performance Report/5-year NCP Review	3-yrs after ISCO Commencement	4 weeks	
8		Institutional Controls Report	Week 10	6 weeks	
9		Monthly Progress Reports	Every 4 weeks	Monthly	
10		Contingent Source Area Remedy	Week 4 (2)	TBD	Duration to be assessed in Final Design and after a review of ISCO effectiveness
11		Contingent Downgradient Plume Remedy	Week 6 (2)	TBD	(same as above)
12		Contingent Pumping of OUI Supply Well	Week 8 (2)	TBD	(same as above)

Notes:

TBD: To be determined

(1) From excution of Consent Decree

(2) From EPA determination of requirement to implement contingent remedy

9.0 *REFERENCES*

Environmental Resources Management. 1999. Baseline Risk Assessment for the Dublin TCE Site, Dublin, Pennsylvania. June 1999

Environmental Resources Management. 2000. Feasibility Study for the Dublin TCE Site, Dublin, Pennsylvania. March 2000.

GeoSyntec Consultants. 2003. Pilot Testing of In-Situ Chemical Oxidation of Chlorinated Solvents in Groundwater, Dublin NPL Site, Pennsylvania. 25 February 2003.

GeoSyntec Consultants. 2001a. Final Report of a Treatability Study of In-Situ Chemical Oxidation and Enhanced Bioremediation of Trichloroethene-Impacted Groundwater, Former Sequa Dublin NPL Site, Dublin Borough, Pennsylvania, September 2001.

GeoSyntec Consultants. 2001b. Workplan For Pilot Testing Of In-Situ Chemical Oxidation And Enhanced In Situ Bioremediation Of Chlorinated Solvents In Groundwater, Former Sequa Dublin NPL Site, Dublin Borough, Pennsylvania, September 2001.

Geraghty and Miller, Inc. 1995. Remedial Investigation/Feasibility Study Report for the Dublin NPL Site, Dublin Borough, Pennsylvania. Volume I, Revised January 1998.

Pankow, James F. and John A. Cherry. 1996. Dense Chlorinated Solvents in Groundwater. Waterloo Press. 522pp.

Yan, Y.E., and F.W. Schwartz, 1999. Oxidative degradation and kinetics of chlorinated ethylenes by potassium permanganate, *J. Contam. Hydrol.*, 37, 343-365.

EPA (United States Environmental Protection Agency). 1992. Estimating Potential for Occurrence of DNAPL at Superfund Sites. RSKERL and OSWER Publication 9355.4-07FS. January 1992.

US Environmental Protection Agency. 2002. Record of Decision - Dublin Trichloroethylene Superfund Site, USEPA Region III, September 2002.

US Environmental Protection Agency. 2003. Draft RD/RA Consent Decree for Operable Unit 2 at the Dublin TCE Superfund Site. US EPA Region III, August 29, 2003.

SDMS DocID 2011300

EXPLANATION OF SIGNIFICANT DIFFERENCES
DUBLIN TCE SUPERFUND SITE

I. INTRODUCTION

Site Name: Dublin TCE Superfund Site

Site Location: Dublin, Bucks County, Pennsylvania

Lead Agency: U.S. Environmental Protection Agency, Region III (EPA)

Support Agency: Pennsylvania Department of Environmental Protection (PADEP)

A. STATEMENT OF PURPOSE

A Record of Decision (ROD) for the Dublin TCE Superfund Site (Site) Operable Unit 2 (OU2) was signed on September 9, 2002. The ROD specified that in-situ treatment will be used in the source area to remediate the contamination in the source area. If the in-situ treatment of the source area does not achieve cleanup to risk based levels of 5 ug/l for TCE, hydraulic containment of the source area will be implemented. The ROD stated that if within three years from the date of the ROD, remediation goals have not been met nor successfully demonstrated that they will be met using in-situ technology, the contingency pump and treat will be implemented. This Explanation of Significant Differences (ESD) has been prepared to revise the three year review period initiation date.

This ESD is issued in accordance with Section 117(c) of the Comprehensive Environmental Response, Compensation and Liability Act, as amended by the Superfund Amendments and Reauthorization Act of 1986 ("CERCLA"), 42 U.S.C. § 9617(c), and 40 C.F.R. § 300.435(c)(2)(i).

The ESD and the information upon which it is based will be included in the Administrative Record file and the information repository for this Site in accordance with the NCP 300.825 (a)(2). The Administrative Record is available for public review at the locations listed below:

U.S. EPA Region III
1650 Arch Street
Philadelphia, PA 19103-2029
Hours: Mon. - Fri., 9:00 a.m. - 4:00 p.m.

Dublin Borough Hall
119 Maple Avenue
Dublin, PA 18917

Questions concerning EPA's action and requests to review the Administrative Record should be directed to:

Anna Butch (3HS11)
U.S. EPA - Region III
1650 Arch Street
Philadelphia, PA 19103-2029
(215) 814-3157

The Administrative Record can also be found a the following website: http://loggerhead.epa.gov/arweb/public/advanced_search.jsp

II. SUMMARY OF THE SITE HISTORY, CONTAMINATION PROBLEMS, AND SELECTED REMEDY

The Dublin TCE Site is located in Dublin Borough, Bucks County, Pennsylvania, and includes a property that is about 4 ½ acres in size. In 1986, the Bucks County Health Department discovered trichloroethylene (TCE) in 23 home tap water samples in Dublin. The highest TCE concentrations were found in a well on the former Sequa property. This property has been the site of several manufacturing operations over the last 50 years, including Kollsman Motor Company which allegedly used and disposed of solvents, including TCE, on the property during its operation. EPA believes that this property is the likely source of the TCE groundwater contamination at the Site. The groundwater had supplied over 100 homes, apartments, and businesses in Dublin that have been affected or potentially could become affected by the TCE contamination.

In 1987, EPA and John H. Thompson, the current owner of the former Sequa Facility property, entered into a Consent Order. The Consent Order required Mr. Thompson to periodically sample business and residential wells in Dublin, and then provide an alternate safe water supply when wells are found to be affected by TCE contamination. Mr. Thompson had installed carbon treatment systems on contaminated wells or provided bottled water. This action prevented any immediate health threat from the site-related contamination.

On December 30, 1991, EPA issued a ROD for OU1. The OU1 ROD was an interim action which included the construction of an alternate water supply. The Remedial Action also requires the quarterly monitoring of residential and commercial wells that were not addressed by the public water supply but which have the potential for contamination. The monitoring will continue until EPA deems it no longer necessary.

A ROD for OU2 was issued based on the findings of the Remedial Investigation (RI), which was modified and accepted by the EPA on December 4, 1998, and the Baseline Risk Assessment (BLRA), which was accepted by the EPA on July 8, 1999. The selected remedy in the ROD for OU2, which is described below, is the final response action for the Site. The remedy addresses the contaminated groundwater at the Site and includes the following major components:

1. Incorporates all the components of Alternative 2.

   a. Continued operation of the Dublin Borough municipal water supply distribution system;

   b. Treatment of groundwater withdrawn by the OU1 supply well to meet Maximum Contaminant Levels (MCLs) using an air stripper as the primary treatment technology, and discharge of the treated groundwater to the Dublin Borough municipal water distribution system;

   c. Institutional controls to permanently limit the 120 Mill Street property to commercial/industrial land use with no residential use in the future and prohibit groundwater use.

   d. Design and implement a long-term monitoring plan for protection of human health and the environment and to evaluate remedy performance/plume migration.

2. Pre-Remedial Design Investigation to optimize all the components of the remedy. This will include pilot testing and design of the in-situ treatment system, the source containment pump and treat system, if required, as well as, further investigation of the dissolved plume for characterization.

3. In-situ treatment of the source area contamination.

4. A contingency to pump and treat 1-4 source area wells to achieve hydraulic containment of the contamination, if the in-situ treatment does not meet remediation goals.

5. Pump and treat downgradient wells, if it is determined to be required by the additional investigation of the dissolved plume.

6. Increased pumping of the OU1 supply well, if feasible.

7. Phased in approach for the remedial action.

III. DESCRIPTION OF SIGNIFICANT DIFFERENCES AND THE BASIS FOR THOSE DIFFERENCES

A. Description of the Changes

The change addressed by this ESD will revise the previous start date of the three year review period from the date of the ROD to the date of the commencement of In-Situ Chemical Oxidation (ISCO) start-up.

B. Rationale for the Change

The change addressed by this ESD was necessary to allow for an adequate time period for ISCO to be demonstrated and evaluated. The negotiation period for signing the C ent Decree has been protracted, therefore, the original three year review period would not allo an adequate demonstration of the ISCO technology.

IV. SUPPORT AGENCY COMMENTS

EPA had notified the PADEP of the changes proposed in this ESD in accordance with 40 C.F.R. § 300.435(c)(2)(i). PADEP concurred with the ESD in a letter dated June 29, 2004.

V. STATUTORY DETERMINATIONS

EPA has determined that the revised remedy complies with the statutory requirements of CERCLA § 121, 42 U.S.C. § 9621. Considering the revision to the three year review period that has been made to the selected remedy, EPA believes that the remedy remains protective of human health and the environment, and complies with Section 121(d) of CERCLA, 42 U.S.C. § 9621(d).

VI. PUBLIC PARTICIPATION

The public participation requirements of NCP, 40 C.F.R. § 300.435(c)(2)(i) have been met in this ESD process.

Abraham Ferdas, Director
Hazardous Site Cleanup Divi n

8/3/04
Date